The Builder.

Vol. LII. No. 2295.
Saturday, January 29, 1887.

ILLUSTRATIONS.

"Spring Time."—Decorative Design by Mr. Herbert J. Draper 182-183
The Hastings, St. Leonards, and East Sussex Hospital.— Messrs. Keith D. Young and Henry Hall, Architects 186-187
Tewkesbury Abbey, from North-East 190
Statue of Admiral Coligny, to be erected at Paris.—M. Crank, Sculptor 191
New Congregational Church, West Croydon.—Mr. W. D. Church, Architect 194
Ingram House, Fenchurch-street.—Mr. Thomas Blashill, Architect 195

CONTENTS.

Mechanics of the Girder 171
Specifications for Practical Architecture 172
Notes 172
On Greek Sculpture as Expressive of the Emotions: Royal Academy of Arts 175
Gloucestershire (Illustrated) 177
The New Drainage Works at the Houses of Parliament (Illustrated) 178
"Spring Time": Decorative Design 179
Hastings, St. Leonard's, and East Sussex Hospital 179
The Coligny Monument, Paris 197
West Croydon Congregational Church 197
Ingram House, Fenchurch-street (with Plans) 197
British Archæological Association 198
The Architectural Association: Professor Corfield on "House Sanitation" 198
Royal Institute of British Architects Subjects for Medals and other Prizes, 1888 200
The Surveyors' Institution: Preliminary Examination, 1887 200
Messrs. John Mowlem & Co. 200
Architectural Societies 200
Case under the Metropolis Management and Building Acts Amendment Act, 1878: Width of Street 201
Sanitary Institute of Great Britain Examinations 201
Sculpture, Harris Free Library 201
Books: Fletcher's Light and Air (Batsford); Haskoll's Land and Marine Surveying (Lockwood) 201
Recent Patents 201
Recent Sales of Property 202
The Student's Column: Field Work and Instruments.—V. 202
A House of Straw 202
Meetings 204
The Berlin Museum of Hygiene 204
Miscellanea 204
Historical Treasures in the Upsala Cathedral 204
Prices Current of Building Materials 205

Mechanics of the Girder.

THE majority of English bridges were erected at a time when there was but little theory to guide the engineer; the principle of leverage and a simple application of the parallelogram of forces were all he had to direct him in proportioning his material, and it is doubtful, even if the more complete methods of the present day had been available, whether he would have been able to find the time requisite for their use. Accordingly, with such precautions as were deemed necessary to "keep on the safe side," approximate formulæ founded upon very limited experiments were considered to be amply sufficient. Now, however, that we have time to look around us, a "learned" education is a *sine quâ non* for an engineer, and he finds ready to his hand the investigations of mathematicians into the structures for whose practical design he is responsible. Applying the general principles of the mathematician to specific cases, the engineer occasionally presents us with an elaborate record of his research, and such a work is that before us,[*] by J. D. Crehore, a recently deceased United States engineer.

Commencing with a simple examination into the action of pressures and forces in a plane, he proceeds to an enunciation of the principle of moments, and shows the application of it to the external forces upon beams and girders variously loaded and supported. The descriptions are accompanied by a concise table of the formulæ for the moments at any section, which must be resisted by the internal forces of the beam; numerical examples illustrate each case, and every care is taken to so arrange the matter that the elucidation of the subject shall be continuous with the explanation of the principles. The most modern terminology is not adopted, but the meaning is nevertheless perfectly clear. With regard to the strains in framed or built girders, the author truly remarks that the published results of trustworthy experiments for determining the ultimate resistance of materials to shearing, are very meagre; those recorded by Rankine and Stoney are given in a table, and show considerable variations. The conditions of experiments are frequently such as do not arise in practice, *e.g.*, in punching a hole through a wrought-iron plate or bar we have a true shearing force, but the support afforded by the surrounding material makes the result useless as an indication of the shearing strength for structural purposes. A large number of diagrams typical of framed trusses for roofs and bridges are given, and their corresponding formulæ, either by the method of moments, or that of shearing forces, or both combined. We are then presented with the mode of estimating the moment of resistance offered by the cohesion of the particles of the material composing a rectangular beam, followed by the moments of resistance of the internal forces of a girder with continuous web, and various hollow and solid forms. As the investigations assume throughout a knowledge of trigonometry and the integral and differential calculus, the use of this book will, no doubt, be limited, but many young engineers who have not yet rusted up will hail it as a very thorough and complete work upon an important subject, leaving no part to guess-work but having everything, so far as may be, mathematically demonstrated. The plane of the neutral axis is generally considered to pass through the centre of gravity of a section under all conditions of strain, although the author confines this position, and we think rightly so, to cases where the elastic limit is not surpassed. He then gives us a very complete table of the ultimate resistance to compression, tension, and cross-breaking, together with the modulus of elasticity, of various materials. This is most useful for reference as a compact summary of all the best known and most important experiments. In the next chapter, which is a long one, the deflections of all the various forms are rigorously deduced from the equation of the elastic curve, and it is then shown that for open girders of the same central height, same length, and of uniform strength, the total deflection is nearly in the inverse ratio of the areas of the figures of the girders.

In connexion with the theoretical dimensions of oak beams for supporting given loads, attention is called to one of the causes for the popular opinion that theory and practice are sometimes at variance. "In order to simplify the work of calculation the equations which determine the dimensions do not pretend to take into account all the conditions affecting the sufficiency of the beam for its purpose, and hence the theory is not complete until the modifying conditions are introduced." The different modes of producing camber, and their effects upon trussed beams, are briefly discussed. The strength of pillars, including all cases of thrust is next considered by rational formulæ compared with the empirical formulæ of Hodgkinson, Gordon, and Rankine, and afterwards with experiments of Hodgkinson, Lovett, &c., but although these are very carefully collated, they only serve to show that we are still very much in the dark as to the true theory of the strength of pillars. The United States Government have a special testing-machine in the Arsensal at Waterton, Mass., and it is hoped that they will shortly contribute a set of values for the constants to be used in formulæ more in agreement with the capabilities of the actual members of the structures than any values hitherto determined. The next chapter of the book deals with the proportions and weights of all the members of a bridge excepting the girders proper, and following this the stresses are determined in various girders, together with their weight and the effect of wind-pressure. The effect of varying the number of bays or panels is followed out in the calculations to present a tabular view of the comparative advantages and disadvantages, and, owing to the mass of calculations, the method appears rather more cumbrous than it really is, considering the value of the results. The author then gives a copy of the general specification for iron bridges issued in 1879, by the New York, Lake Erie, and Western Railroad Companies, containing much useful information for designers. We have only space for a few extracts:—

"The following modes of construction shall preferably be employed:—Spans up to 17 ft., rolled beams; 17 ft. to 40 ft., riveted plate girders; 40 ft. to 75 ft., riveted lattice girders; over 75 ft., pin-connected trusses. In calculating strains, the length of span shall be understood to be the distance between the centres of end pins for trusses, and between centres of bearing-plates for all beams and girders. . . . . Variations in temperature to the extent of 150 degrees shall be provided for. . . . . All parts of the structures shall be so proportioned that the maximum strains produced shall in no case cause a greater tension in pounds per square inch than the following:—On lateral bracing, 15,000; on solid rolled beams used as cross floor beams and stringers, and on bottom chords and main diagonals, 10,000; on counter rods and long verticals, on bottom flange of riveted cross girders net section, and on bottom flange of riveted longitudinal plate girders over 20 ft. long, net section, 8,000; on bottom flange of riveted longitudinal plate girders under 20 ft. long, net section, 7,000; on floor beam hangers, and other similar members liable to sudden loading, 6,000. . . . . In beams and girders, compression shall be limited as follows:—In rolled beams used as cross floor beams and stringers, 10,000; in riveted plate girders used as cross floor beams, gross section, and in riveted longitudinal plate girders, over 20 ft. long, gross section, 6,000; in riveted longitudinal plate girders under 20 ft. long, gross section, 5,000. . . . . The rivets and bolts connecting all parts of the girders must be so spaced that the shearing strain per square inch shall not exceed 6,000 lb., nor the pressure upon the bearing surface exceed 12,000 lb. per square inch of the projected semi-intrados

---

[*] Mechanics of the Girder: a Treatise on Bridges and Roofs, in which the necessary and sufficient Weight of the Structure is calculated, not assumed; and the Number of Panels and Height of Girder that render the Bridge Weight least, for a given Span, live Load, and Wind-pressure are determined. By John Davenport Crehore, C.E. New York: John Wiley & Sons. London: Trübner & Co. 1886.

(diameter by thickness of piece) of the rivet or bolt hole. Pins shall be so proportioned that the shearing strain shall not exceed 7,500 lb. per square inch, nor the crushing-strain upon the projected area of the semi-intrados of any member connected to the pin be greater than 12,000 lb. per square inch, nor the bending-strain exceed 15,000 lb. per square inch when the centres of bearings of the strained members are taken as the points of application of the strains. . . . . The compression flanges of beams and girders shall be stayed against transverse crippling when their length is more than thirty times their width. The unsupported width of any plate subjected to compression shall never exceed thirty times its thickness. . . . . The iron in the web-plates shall not have a shearing strain greater than 4,000 lb. per square inch, and no web-plate shall be less than ¼ in. in thickness. . . . . When the least thickness of the web is less than one-eightieth of the depth of a girder, the web shall be stiffened at intervals not over twice the depth of the girder. The pitch of rivets in all classes of work shall never exceed 6 in., nor sixteen times the thinnest outside plate, nor be less than three diameters of the rivet. The rivets used will generally be ¾ in. and ⅞ in. diameter. The distance between the edge of any piece and the centre of a rivet-hole must never be less than 1¼ in., except for bars less than 2½ in. wide; when practicable it shall be at least two diameters of rivets. When plates more than 12 in. wide are used in the flanges of plate or lattice girders, an extra line of rivets, with a pitch of not over 9 in., shall be driven along each edge to draw the plates together and prevent the entrance of water. . . . . The pins shall be turned straight and smooth, and shall fit the pin-holes within one-fiftieth of an inch. . . . . All bed-plates must be of such dimensions that the greatest pressure upon the masonry shall not exceed 250 lb. per square inch. All bridges over 50 ft. span shall have at one end nests of turned friction-rollers formed of wrought iron, running between planed surfaces. The rollers shall not be less than 2 in. diameter, and shall be so proportioned that the pressure per lineal inch of rollers shall not exceed the product of the square root of the diameter of the roller in inches multiplied by 500 lb. Bridges less than 50 ft. span will be secured at one end to the masonry, and the other end shall be free to move by sliding upon planed surfaces. . . . . In riveted work all surfaces coming in contact shall be painted before being riveted together."

In chapter x. we have a section of 100 pages devoted to a practical illustration of the author's method in working out all details of a Brunel girder bridge, consisting of two equal parabolic double-bow girders, with top and bottom chords of same curvature. It was the intention of the author to carry out similarly an example in each of the twelve classes of girders which he delineates; but his death in 1884 left the work unfinished, and we have at present only one other example worked out, viz., the parabolic bowstring girder, of double triangular system, with which the book closes; the method of working is, however, fully set forth in the earlier pages, and we are promised the completion of the remaining examples by Professor John N. Stockwell, who has supervised the passage of Mr. Crehore's MS. through the press. The "method of moments" in this form is not much in favour among bridge designers in England, but possibly its use may become more extended when it is seen how applicable it is to the investigation of the economics of construction, and no one has more fully exemplified this than the author of the present work.

SPECIFICATIONS FOR PRACTICAL ARCHITECTURE.*

IT is so seldom that an architect addresses himself to serious literary work that we are most reluctant to discourage such attempts by a too rigorous criticism. Still, there are cases in which plain-speaking is a duty, and the work before us presents such a case. The original edition of Alfred Bartholomew's "Specifications for Practical Architecture" was published in 1839. It met with an immediate and deserved success, was re-issued in the following year, and republished with revisions in 1846. It was the first attempt to reduce the art of specification writing to a system, and was prefaced by an essay on the history of the art of building. Its author possessed all the necessary qualifications for the task, a wide experience of practical building, a true feeling for art, a vast store of archæological and antiquarian learning, and a literary style of singular clearness and force. This once popular text-book has been for many years out of print, and it was a happy thought to revive and revise it for modern use.

The prefatory matter which forms the first part of the original work should have been reprinted intact for its historical interest, or omitted as no longer applicable to the present state of the art; or, if modified and modernised, should have been so printed as to leave the variations readily distinguishable. The editor has, however, taken a different view. He has mutilated the original text,—omitting about one half,—and he has not brought the remainder to date. The author's remarks on the Elizabethan and other impure styles have been cut out, either because the editor does not share the expressed objections to those styles, or because a change in the public taste has sanctioned their use. It may be fairly inferred that the editor endorses what remains of this prefatory essay. But will he seriously maintain that in this our day "our *only* endeavour is to copy at second-hand some ancient work in bad, improper materials"; that architects "are not sufficiently acquainted with the principle of the truss"; that we "expend our means in *concealing* chimney-shafts" (shades of Norman Shaw & followers!); that architecture has scarcely received from mechanical science "one machine for facilitating, improving, and rendering more exact the operation of building"; and, finally, does he really believe that even our public institutions become "in the first year of their existence masses of creaking ruins," filling every mind with "one humiliating feeling of disgust"? If he does not believe that this is a fair picture of the art as now practised, why does he publish it and hold up the profession, of which he is himself a member, to the scorn of the Philistines?

But, to come to the specifications themselves, which form the second part of the book. They have been reduced in number from fifty-four to twenty-seven, and with this we have no fault to find. They might have been still further reduced with advantage if only those retained had shown something of that "thorough and careful revision" which the editor claims to have exercised. Of the new systems of building, to which reference is made in the preface, we see little or nothing. As to the "greater attention given to hygienic matters," rendering certain additions to the text necessary, let us take this portion of the work for examination.

Chapter xvii. is a specification for a mansion, and here, at least, the subject of drainage may be expected to be fully gone into. We note in passing that all reference to a damp-course is omitted; but that is a trifle. Under the marginal note "Drainage," we are referred back to p. 77. This is a specification for a small dwelling-house" (of the fourth rate in the original edition), and does not look a very promising beginning of an important subject. At p. 77 this is what we find:—"Drainage, &c. To lay to a fall of 1½ in. in 10 ft., 6-in. socket-jointed earthenware soil drain-pipes, and 4-in. branch drains from the rainwater-pipes, with proper Y and other junctions, bends, and diminishing pipes, trapped to all outlets, as shown on plan of drains."

It is not necessary for us to enlarge upon the scantiness and imperfection of this description. Let us try again. For the sinks we are referred to p. 81, and there the waste is properly described as being carried through the wall and discharging over a gully. Under "Butler's sink" we find, however, this instruction "Line the butler's sink . . . . with bell-trap and connexion with the drains."

What sort of connexion? At p. 390, the last example in the book, it is stated casually in a note that rain-water pipes and wastes are *not* to be connected direct with the drains. It is the business of a specification to show how much work *is* to be done, and it is provided for in the earlier examples as follows:—

"To put to the sink in the scullery a 2-inch strong lead waste to *lead into the drains.*"

"Put stacks of rain-water pipes from flats of projection (*sic*) bays and carried into *drains.*"

"To put from the sink to *the drains* a 2-inch strong lead waste-pipe, &c."

We can find no reference whatever to the customary intercepting traps, the fresh-air inlets, the split pipes, the inspection pits at changes of direction, the flushing-tank at head of drains, nor to any of the points to which every architect now attends in the performance of this portion of his work.

We are almost afraid to call attention to these omissions lest the "Sanitary Engineer," for whom amongst others the book is written "as a guide," and who is now usurping the architect's position, should bring it before his clients as an indication of the manner in which the architect of to-day deals with this important part of his duty.

It would be an endless task to criticise in detail these model specifications. They teem with inaccuracies of all sorts. Precept and example are in perpetual conflict. The use of gauged brickwork is condemned and enjoined throughout, and all sorts of separate subjects are jumbled together. Pieces of carelessness, such as the provision of wash-out closet-pans with *three-quarter inch service-pipes;* and such antique injunctions as "put to internal doors wood mouldings to *resemble* architraves" are met with. Such paragraphs as this appear: "Put to *all* the windows Portland stone sills . . . . and to all the *other windows,*" &c. &c.; whilst the typographical errors—"damp corner" for damp course, "period" for per rod, "cubit" for cubic,—are incredibly numerous. Two words which should be banished from all scientific specifications are sprinkled thickly over the pages, viz., "proper" and "patent"; everything is to be "proper" or properly done,—which is not by any means specific; and "patent" is used as though there were in every case two articles, one patented and the other not,—patent lines, patent fasteners, patent w.c. apparatus, patent everything. The contractor for the fourth-rate dwelling-house is given the alternative of copper or zinc nails for the slating! Vagueness is carried in some instances to an extent which runs very closely the amateur quantity surveyor's celebrated "No. 1 bay window complete."

We have, however, no heart to pursue further the distasteful task. A book on specifications has still to be written, and possibly the editor has all the necessary practical knowledge and literary qualifications, if he would only give himself the requisite trouble. But he should substitute the pen for the scissors, and for the long wail over the ignorance and backsliding of his professional brethren,—which is as inaccurate as it is irrelevant and unseemly,—a carefully-written description of the various building processes as now pursued. He may then produce an edition "based on" Bartholomew's book which shall be really useful to the student, and we promise it in advance a welcome in proportion to its deserts.

---

* Specifications for Practical Architecture: a Guide to the Architect, Engineer, Surveyor, and Builder, &c. Upon the basis of the work by Alfred Bartholomew. Thoroughly revised, corrected, and greatly added to. By Frederick Rogers, Architect. London: Crosby Lockwood & Co. 1886.

NOTES.

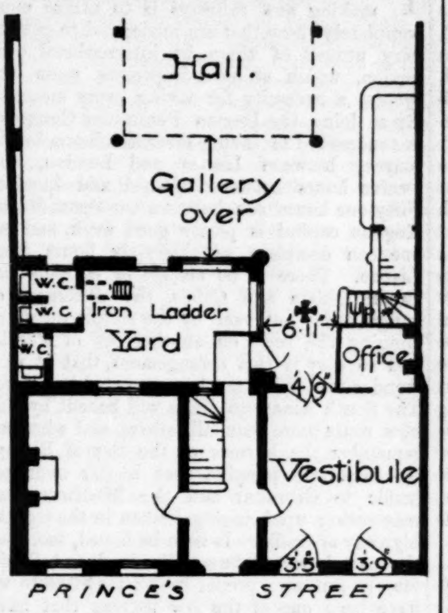
THE Works Committee of the Metropolitan Board of Works have selected from the candidates for the post of Superintending Architect the following six names for further consideration:—Mr. A. Peebles, Mr. Rowland Plumbe, Mr. H. Gundry, Mr. T. Blashill, Mr. P. Gordon Smith, and Mr. E. J. Tarver. The Committee intend to recommend that the election be proceeded with on Friday next, the 4th of February. It may be remarked that the first four candidates on the list are all District Surveyors under the Board, and Mr. Gordon Smith is Architect to the Local Government Board, so that Mr. Tarver is the only one of the six selected who is a non-official architect. From among these six candidates the Board will be able to make a good selection for the post; but we cannot help expressing surprise at their ignoring the claims of their present Acting Superintending Architect, who seems to have been passed over for some reasons not apparent on the surface.

Since this was written we find that Mr. Williams has given notice that, when the recommendation of the Committee comes before the Board, he will move:—

> “That the voting on the six selected candidates for the office of Superintending Architect be by ballot, and that the ballot be taken by each member of the Board writing one name of a candidate on a piece of paper, and so continuing until one of the candidates has a majority of the votes, and that at each count of the votes the name of the candidate who has the least number be struck out of the list.”

FROM Mr. Westgarth we have received a pamphlet consisting mainly of a reprint of two papers contributed by him to the Journal of the London Chamber of Commerce. The object of the papers is to show briefly how the “appreciation” or rise in the standard value of gold has had an influence in temporarily reducing profits, for a concise explanation of which rather difficult subject we refer the reader to Mr. Westgarth's pamphlet,* which puts the matter very clearly for the intelligence of the non-economic reader, though perhaps Mr. Westgarth does not bring forward quite prominently enough the necessarily temporary character of the influence and the almost certainty of a compensating re-action of the balance sooner or later in an opposite direction. The second portion of the pamphlet is devoted to a suggestion for the employment of labour in work for which the profit is to be obtained by “natural increment” (which phase Mr. Westgarth prefers to “unearned increment”), in plainer language by holding on to the property till its rise in value in the natural course of things affords an adequate return for the outlay. Mr. Westgarth draws attention to the fact that outlay has already been incurred on this principle, in the Birmingham Municipal improvements and in some of the schemes of the Metropolitan Board of Works. As a matter of fact, it has often been tacitly acted upon; but the author wishes to suggest that this is a means of employing labour and putting out capital in an ultimately remunerative manner, which is destined to be much more largely and systematically employed than it has been. As a practical illustration to his paper, he cites the Houndsditch area as one where extensive improvements and rebuilding might be carried out to the employment of many hands, with the certainty of a large return eventually, from its contiguity to the increasingly overcrowded “city,” and the same principle would apply to other sites which might be named. The difficulty is, perhaps, to find capitalists who can afford to wait long enough for their money.

WE append a ground plan of so much of the hall of the Hebrew Dramatic Club in Spitalfields as will serve once more to point the moral of such disasters as that which occurred a few nights ago to a panic-stricken crowd. The case is all the more noteworthy in that the defective planning which contributed to the disaster could easily have been obviated. The ✠ shown on the plan indicates the spot where the two streams of persons,—one coming from the body of the hall, and the other down the stairs from the gallery,—impinged and became jammed together. The stairs from the gallery could easily have been carried down in a straight line over the space marked “Office,” instead of being turned at right angles, and with “winders” too. The vestibule is apparently wide enough to take both streams of people had they been both passing in the same direction, even without any barrier or partition wall to divide them, as would be preferable, and as is required by the Metropolitan Board of Works in buildings over which it has control. Too much attention cannot be paid to the planning of the exits of all buildings where large numbers of people assemble. Former disasters have shown that exits which might be sufficient when used by an audience of intelligent, self-controlled people (we doubt whether large audiences of such are often brought together) are totally inadequate when there is a helter-skelter rush of panic-stricken people upon them. That the large hall in Spitalfields should not be under the control of the Metropolitan Board of Works, while every little first-floor room of an ordinary public-house, if used as a concert-room, is under their jurisdiction, is one of those anomalies which are so abundant in the details of London “government.”



THE circumstance that the funds raised by means of the Coal and Wine Dues have been almost exclusively devoted to the carrying out of public improvements within the metropolis itself seems to give good ground to the contributing outlying districts for desiring some alteration in the mode of administering these funds. The Acton Local Board has secured the support of most of the suburban authorities to a petition which, though not seeking the total and unconditional abolition of these dues, urges the application, in their administration, of the principle that representation and payment should go together. And there is no doubt that if the outlying districts were properly represented in this respect, the benefits derivable from these revenues would be extended, in a fair and equitable measure, to all parts of the contributing area. It is asked, for example, why should the inhabitants of districts as far west as Kingston-on-Thames and Staines be called upon to contribute by these dues funds for the construction of the proposed tunnel underneath the Thames in the east end of London? A carefully-prepared Bill, conceding to the outlying districts the principle of representation in regard to these dues, and the extension of their benefits to the whole of the contributing area would take away a great deal from the arguments of those who would totally abolish them.

MANY of our readers will have heard with great regret of the early and unexpected death of Mr. Alfred Newman, the worker in wrought iron, whose *atelier*, carried on under the firm of A. Newman & Co., has exhibited a remarkable progression since its comparatively recent establishment. Mr. Newman united in an unusual degree the qualities of business capacity and artistic taste; he thoroughly understood the principles of the treatment of wrought-iron work, and took the greatest interest in the adequate carrying out of designs entrusted to him; going into every detail, and often making valuable suggestions for the improvement in detail of designs entrusted to him for execution, especially in regard to facility of working, and appropriateness to the capacities of the material employed. His work was formerly carried on in some rooms in Marlborough-mews, whence he had not long since removed to the rooms in Archer-street, which had already become well-known to architects and others interested in the production of wrought-iron design, and which presented to the visitor an interesting combination of artistic detail and practical workmanship. Several of Mr. Newman's works have been illustrated in our pages from time to time. Mr. Newman had been employed on among other things the great wrought-iron lamp standards for Eaton Hall, for the Marquis of Westminster; he had also carried out a good many wrought-iron signs for various premises in London, notably the large one which forms such a conspicuous object at the angle of Mr. Norman Shaw's picturesque building at the end of Pall-mall. Another characteristic work which we illustrated was the grille, with the spider in the centre, made for the entrance door of a house in Prince's-gate. Mr. Newman's loan exhibition of wrought iron work, ancient and modern, in some rooms in Bond-street a year or two ago, and his Saturday expositions on the subject to artisans, attracted much attention; and his forge in the grounds of the Health Exhibition was one of the centres of interest there. Only two or three weeks before his death we took part in a consultation with him and his chief artisan at the rooms in Archer-street, on the carrying out of a design of peculiar type; and he was then full of energy and interest in his work. Mr. Newman was quite a young man, and his death has terminated unexpectedly a career highly creditable to him, as that of one who put his whole heart and ability into everything he undertook.

REVERTING to the mention made by us last week as to the opportunity which now presents itself for the re-erection of Temple Bar on a site which, as was pointed out in our columns nearly two years ago, is a peculiarly appropriate one, viz., at the eastern entrance to the Temple precinct, we are glad to see that Mr. G. Gilbert Scott has written to the *Standard* in support of the suggestion. We have received a letter from Mr. J. R. Morgan, the Secretary of the Temple Bar Reconstruction Committee, stating that the remains, though no very great care has been taken of them, are in a better condition than might have been supposed, and approving of the idea of seeing the monument re-erected on the site proposed. Mr. Morgan states that the committee have been given to understand that, though the Corporation are indifferent as to the re-erection of Temple Bar, the stones will be presented to any one finding a site and the cost of erection.

THE last two numbers (35 and 36) of Baumeister's *Denkmäler des Klassischen Alterthums*, a publication the more noteworthy of whose issues we have drawn attention to from time to time, contains an article on Pergamos of special popular interest. It is not every one who can consult, still fewer who can possess, the magnificent work which the Prussian Government have published on the recent excavations. Now, at the cost of a few shillings, any one can obtain a reliable account of the whole proceedings, and, what is even more desirable, a series of plates, which are in most cases very respectable reproductions of the now famous marbles. The great frieze of the altar is by now in part known to every one interested in art; photographs of it have, however, been dear and scarce. As to the smaller frieze, known as the “Telephos frieze,” it is practically almost unknown. It is less well preserved, and of far less sensational interest, but in connexion with the history of art it is quite as important. The reason of its comparative obscurity is, no doubt, the fact that even at Berlin the original is not yet exposed to public view, though the courteous directors are always willing to show it to the professional visitor. We are glad to find that in the *Denkmäler* three of the slabs are figured, and in the text the interesting but little known myth of Telephos is fully discussed. The old and incorrect restoration of the great altar is unhappily given, but the editor states in a note that he is aware of the recent correction. This correction appears in a general view of the whole Acropolis.

✠

---

* To be had from F. C. Mathieson & Son, Bartholomew House, E.C.

WE recently called attention to the discovery of the statue of a running girl in the excavations at the Villa Spithoever. The statue is just published, front and side views, in a fine phototype in the *Bulletino della Commissione Archéologica Communale di Roma* (iii., 11), and turns out to be of even more interest than was expected. The statue has lost the head, arms, and lower part of both legs, but enough remains to show a curious and very close correspondence with a passage of Pausanias. Speaking of the races run by the maidens at Elis, in honour of Hera and in memory of the contest for Hippodameia, he says, "They all run with their hair loose down their back, and they wear a short tunic to below the knee, and the right shoulder is bare to the breast." All these characteristics appear with singular exactness in the Spithoever torso, so that there can scarcely be a doubt that we have a votive statue set up by a victorious maiden. She was represented as *actually running*, not as just about to start, like the Vatican running girl. The style of the new statue is of the fine period, and the drapery is of singular freedom and grace, drapery that it was possible to run in, a singular delight in these days, when part, at least, of "the human dress is forgèd iron."

THE current issue of the *Board of Trade Journal* contains the following extract from a report on the water and sewer works at Warsaw, made by Mr. H. Grant, H.M. Consul in that city:—"The works undertaken in 1882 by Mr. W. H. Lindley for providing this city with a daily supply of 600,000 cubic feet of well-filtered water and with sewers measuring 58,000 ft. in length, at a cost of 350,000*l.* sterling, will be completed next spring, when it is expected they will be further extended, as the above supply of water will only suffice for about half the present population of Warsaw (420,000), and the same may be said of the sewers." The following articles required for the works have been supplied from England:—Stoneware invert lining, stoneware pipes, fire bricks, steam engines and boilers, cocks, and sluice-valves. The field is now open for water and sewer fittings, taps, water-closets, syphons, gullies (street and yard); also stoneware pipes and specials for house drainage (4 in. 6 in. and 8 in. diameter), stoneware gullies, &c. Lead piping will also be required, but it is doubtful whether British makers could compete in this.

WE have before referred to investigations as to the use of galvanised iron for water-pipes, and we have now another report on this subject from a German source, which is quoted in the current volume of the Proceedings of the Institution of Civil Engineers. At the 26th annual meeting of the German Gas and Waterworks Engineers, held at Eisenach, Dr. Bunte presented the report of a committee that had been appointed to inquire into the suitability of galvanised iron for water-pipes. As a result of numerous experiments made, it appeared that in the case of new pipes the water invariably took up zinc; but notwithstanding this, was in no way injurious to health. After some discussion the meeting unanimously decided the "employment of galvanised wrought-iron pipes for water supply occasions no injury to health."

MR. ACLAND'S letter in the *Times* of the 21st inst. demands the consideration of the powers that be. He pointed out the difficulties which exist in the obtaining of Government publications, such as reports of Select Committees and Royal Commissions. Not only is their price high, but their form is very inconvenient, indexes and tables of reference are often published long after the evidence or the report appears. Except by very special application and at the expenditure of some trouble, it is not possible to obtain these publications. It is clear that reports and similar documents should be published at a reasonable price in a convenient form so that they should be not only published in the sense of being printed but should be issued in such a manner that any one interested in the subject of which they treat should be able to obtain them without difficulty and at a reasonable price.

THE next thing to abolishing distance by making new railways is to utilise more completely those that are made, and to get the very utmost of them by international connexion, which at once impresses upon the system a necessity for saving every moment. By so doing, the Iberian Peninsular Company has succeeded in saving seventeen hours in the journey between Lisbon and London, and twelve hours between Madrid and London. Fifty-one hours' run between the Spanish and English capital is pretty good work, and no one can complain of thirty-six hours from Lisbon. There is no change of carriage between Lisbon and Calais, the difference of gauge being got over by the simple means of slinging the body on another set of wheels, and so easy is this arrangement, that it is a wonder that it has not been resorted to before. The South American trade will benefit by this new route more than all others, and when we remember the horrors of the Bay of Biscay, we may well imagine that a fair overland traffic to Gibraltar and the Mediterranean may spring up, bringing Lisbon in the regular highway of traffic. It is to be hoped, too, that the parcel post between England and Spain may be put on a proper basis; for hitherto we have been one of the few nations that have been bereft of that privilege.

WE have received from Messrs. W. Cooke & Co., of Leeds, a number of samples of their "Golden Lustre Silk Paperhangings," which are, in fact, wall-papers of the usual types of design, but made, by a special process, with a surface having a silk-like lustre, and with something also of the richer texture of silk, as compared with ordinary paper. We are not, we confess, liable to be moved to any great enthusiasm about improvements in wall-papers, having a deeply-seated conviction that wall-papers are at the best an evil which it is for the time necessary to be subject to, because no other more sanitary and equally economical method of giving a decorative surface to the interior of a room has been devised. Apart from this general principle, however, we admire the effect and lustre of these papers, which may afford a new item in decorative effect, at a moderate cost.

A PROJECT is on foot to provide a new parish church for Hornsey. The Rev. James Jeakes, rector, has offered a site in Church Yard for an edifice to receive 1,200 persons. An amount of 4,000*l.* is already promised, under certain conditions, to the building fund. The existing church, rebuilt in 1832, is conspicuous for its ivy-clad tower, that dates from the fifteenth century. In the graveyard are buried Rogers, the poet, who once lived at Stoke Newington; and a daughter of Tom Moore, who for awhile occupied a cottage at the foot of Muswell, or rather Mousewell, hill. The surrounding woods are remains of the ancient manor and park of Haringhee or Harringay, that were reserved for the chase by the bishops of London. In the bishops' palace Henry VII., on his accession, was offered homage by the citizens of London. Hornsey Wood together with the later Wood House or tavern, and its lake, near to the Sluice House, a favourite resort for cockney anglers of the last generation, is now represented by Finsbury Park. The park covers 115 acres of the Finsbury division of Ossulston Hundred.

SOME old houses by the entrance into Fleur-de-Lis-court, Fetter-lane, are about to be demolished. That to the left hand is a traditionary home of Dryden, who is said, when living here, to have opened a quarrel, in verse, with his neighbour, Otway, across the street. This house bears a tablet to the memory of "glorious John!" It is remarkable for the two liens' heads above its side piers. The house on the right hand of one entering the court is notorious for the murder there (1767) by Mrs. Brownrigg of her apprentice Mary Clifford. They who are curious in such matters may see the cellar-grating through which the victim's screams were heard. Here was formerly one of the fishing-tackle shops for which Fetter-lane was at one time renowned.

AT their recent annual general court the Honourable Artillery Company of London resolved to commemorate the Queen's Jubilee concurrently with the 350th anniversary of their own embodiment. The commemoration will consist of the addition of a new wing to the Armoury House, by Bunhill-fields, together with a spacious drill-hall and riding-school, to cover an area of 65 ft. by 108 ft. The ground they now hold, being part of the prebendarial manor of Finsbury (more correctly, Holywell), was originally leased to them in 1641, under name of the New Artillery Garden. This regiment is singular in its absolute emancipation from anything in the form of Parliamentary control. The members of the infantry battalion are commonly regarded as modern representatives of the City Trained Bands. But they quite repudiate an honour which more strictly appertains to the City of London Militia, whose headquarters adjoin to their own. There are records to show that in 1796 the Court of Assistants resisted,—and for some months with success,—the use of their ground by the London Militia, who had been enrolled, or rather, reorganised, in the previous year. The Company, distinguished as "Honourable" in 1685, claim status and governance in virtue of certain royal warrants granted and confirmed to them by our several sovereigns from a date when "regular" forces were not. In the year 1537 King Henry VIII. gave to them a charter of incorporation, with the style of the "Fraternity or Guild of St. George." Their muster-rolls comprise an unusually long list of highly eminent personages. In 1770 John Wilkes was elected as a "general." Alderman Beckford, Monk, Milton, Prince Rupert, the Duke of Monmouth, and Sir Christopher Wren, were also members of the corps. It is this Company who are represented as firing upon the "No Popery" rioters in Broad-street (on the 7th of June, 1780, Walpole's "fatal day"), in F. Wheatley's fine drawing, after an etching by J. Moth. Some of our readers are perhaps familiar with Picket's large-sized aquatint, after E. Dayes, of the inspection at Finsbury by the Earl of Harrington, on the 22nd of September, 1803, wherein the artillerymen are shown as drawing their cannon with ropes. The Jubilee festivities will be attended by delegates from the Artillery Company of Boston, U.S., founded there in 1738 by an emigrant member of the Company in London.

THE Baths Committee of Bath, not satisfied with Mr. Penrose's report, have now called on Mr. Waterhouse to report both in regard to the stability of the new building and the steps taken to keep the Roman baths remains unobstructed. On the latter part of the matter Mr. Waterhouse does not differ much from Mr. Penrose; he considers the City Architect has steered a fair course between archæology and practical requirements. This may be fairly said, perhaps, though it strikes us that both reports were (unconsciously, no doubt) drawn up rather in the terms of an advocate of the City Architect than of a judicial critic. Mr. Waterhouse is against the idea of making a vaulted basement for the special purpose of enclosing the Roman remains, on the ground that it will spoil the new rooms above by taking away from their height, and that the Roman remains will get very little light in that way. He is emphatic, however, in saying that every means should be taken to facilitate inspection of the Roman remains, and to isolate them completely would have been the most effectual way of doing this. Part of the mischief was done before the fight began about it; and the matter seems unfortunately to have been argued out by two parties, each holding rather exaggerated views in opposition to the other side. The archæologists are no doubt somewhat neglectful, in their zeal, of the practical requirements of the modern baths;

while the City Architect and his allies seem actuated a good deal by a spirit of opposition and a determination not to take anybody's advice if it does not agree with their own opinion. Mr. Davis has not done all the damage to the remains that he is charged with; but he might have done still less if he had given his efforts to that object.

A CORRESPONDENT sends us a delightful specimen of "Instructions to Competing Architects" for a competition for a proposed cemetery at Fareham, Hants. No premiums are offered, and each competitor is to send a statement for what commission on the outlay he will do the work of planning and superintendence; so that apparently the "job" goes to the lowest bidder. Do the Fareham Local Board imagine they will get the services of any competent professional man in response to such an advertisement?

ON GREEK SCULPTURE AS EXPRESSIVE OF THE EMOTIONS.

ROYAL ACADEMY OF ARTS.

Mr. A. S. Murray, Keeper of the Greek and Roman Antiquities in the British Museum, delivered the first of a series of three lectures on this subject, on Monday evening, to the students of the Royal Academy. He commenced by saying that it was a matter of common belief that Greek sculpture was singularly defective in expressing the emotions. Without stopping to contest the accuracy of the belief, which was partially shown to be ill-founded by such groups as the Laokoön, its origin and prevalence might, perhaps, be accounted for by the fact that our knowledge of the ancient Greeks had come down to us more through their literature than their art. It was usual with most people when they saw a piece of Greek sculpture to be content with the thought that it was Greek; that it had come down to them from a nation whose art they had been taught to admire; that it was strangely attractive to them by its costume, its attitudes, its lines, its modelling of form. They rarely set themselves to interpret it; it was enough that it was Greek. Their ideal was the Parthenon. They did not trouble to think much about the older sculptors who worked out the beginnings of the art and launched it on its prosperous voyage; nor did they mind overmuch the later sculptors, whom new impulses drove beyond the severe limits of the Parthenon. Worst of all, the remains of Greek sculpture were but a fragment of the whole, and that fragment we viewed only in such aspects as suited us. While it was true of the literature of the ancient Greeks that it was one of measured dignity and reserve, yet that was not the whole truth. The plays of Aristophanes were an obvious exception; and if the vast number of comedies which we knew now only from fragments had met with a better fate, we should have had more than enough of evidence as to the faculty of the Greeks for observing and characterising emotions of one kind or another. He did not know whether it was meant for blame or praise,—possibly sometimes the one and sometimes the other,—when it was asserted of Greek sculptors that they were defective in expressing the emotions as compared with the sculptors of modern or comparatively modern times. If it were meant for blame, the blame could not be just, even if it were true. A fair comparison would be between the Greeks and their predecessors, the sculptors of Egypt and Assyria, because the Greeks had many opportunities of learning from them or of profiting by their mistakes. It would be a fair comparison also from the fact that in both those nations sculpture had long flourished, if not with the same freedom as in Greece, yet with ample encouragement. In Egypt it was an art which ministered to the deepest thoughts and most sacred hopes of the people. In innumerable instances it was called upon to furnish forth a true presentment of famous deeds and famous men. But if inquiry were made as to what the Egyptians had done in that matter of expression, and if their works were contrasted with those of the Greeks, the advantage would be found to be on the side of the Greeks. Even in Assyria, where the sculptor was free to deal with forms and incidents of daily life, and to reproduce them in a manner likely to please and gratify the common tastes of the day, we found extremely little in the way of representation in sculpture of the human emotions. As a rule, the Assyrian sculptor preferred action, and passed over the passions or emotions out of which it had arisen. The lecturer next proceeded to define what he meant by the phrase "expression of the emotions." No doubt, he said, there were certain emotions which were habitually expressed by certain actions. For instance, fear was expressed by opening wide the eyes and mouth, by the beating of the heart, the paleness of the skin, and, as fear increased to terror, by the hair standing on end and by the limbs losing their power. And this was true of savages as of educated persons. At the same time, the degree of intensity with which those actions were evoked might differ widely in differently-constituted men, or even in the same men under different circumstances. As an example of this, the lecturer quoted the beautiful scene in the Odyssey where Nausicäa and her maidens, while playing at ball on an open field, were startled by the sudden appearance of Ulysses, stripped by shipwreck of every rag of clothing he had possessed. The maids screamed and ran in horror, but the Princess Nausicäa awaited calmly to hear the story of the poor castaway. Homer, it would be allowed, was no bad observer of the different ways of expressing emotion in different classes of people. In reference to the scene referred to, there could, the lecturer supposed, be no question that the princess experienced the same emotion of surprise and fear as did her maids; she only revealed it in a different manner. He had not noticed that that different manner of expressing emotion in different classes of persons had been dealt with by Darwin and Herbert Spencer in their inquiries on that general subject. From their point of view it was best to gather as much evidence as possible from the average of mankind, if not from savages and others below the average, and thus establish the link between man and the lower animals. Besides, their object was to show that certain emotions, when they were produced at all, were manifested in the like manner in all persons; whereas the artist, in reproducing a particular incident, might treat it as the cause of strong emotion, or the reverse, according as he conceived the character of the persons whom it affected. He might make a child moved with terror while a grown-up person beside it remained perfectly calm. He might take his model from the market-place, where the slightest incident produced overdone emotion, or he might go to the other extreme, and find types of persons who had steeled themselves in presence of causes which produced emotion in others. The lecturer's argument was that in Greece there were sculptors who took both directions, but that naturally the better sculptors chose the better types to work upon. That might appear to be a confession that the best sculptors of Greece avoided the expression of emotion; but he (the lecturer) had still to consider whether, by selecting a type of man steeled against the direct expression of emotion, and placing him in circumstances which would greatly move a different person, one might not equally convey the powerful, though not emotional, effect on him. It might be asked, did the Greek sculptors, like their contemporaries the dramatic poets, recognise the need of any contrast or foil to their tragic or serious compositions? and, in recognising that need, did they produce other statues or compositions intended to express emotions among beings of a lower nature? One would think that they must have occasionally experienced, after the strain of a more or less tragic composition, the same necessity of a spontaneous outburst of common nature in which they might give plastic form to their observation of scenes or incidents in daily life. We could easily understand how works of that kind were allowed to perish along with the multitude of satyric and comic plays which in later times no one cared to preserve. But a difficulty arose here, for whereas we had a record of the existence of the comedies, we had little or no record of works of the kind here contemplated being executed by the sculptors of the great age. We might fancy that Polykleitos, a sculptor renowned for the severity and dignity of his style, must have relaxed those qualities when he made a group of two boys playing at knuckle-bones. Or we might reinforce the argument by appealing to the story of the painter Zeuxis having died of a fit of laughter at the figure of an old crone which he had himself painted. But, after all, the conclusion appeared to be inevitable that the vast proportion of sculptors in the best age dealt with subjects of a grave and serious turn, where emotion was naturally made evident by repression rather than by expression. In time there arose a new and separate class of artists who addressed themselves gradually, and at length specially, to a lighter kind of work, just as the strictly comic poets of Greece might be said to have arisen to produce the fun and drollery which their tragic brethren could not always command, the result being that the tragic poets were soon banished altogether from the stage, the comic poets reigning in their stead. Much of this lighter kind of work, displaying the keenest observation of the emotions, had survived to our day, and examples of it would be mentioned later on in dealing with the later stages of sculpture, for it was part of the lecturer's argument that the steady progress of Greek sculpture from its early times was accompanied by a progress in the expression of the emotions. The lecturer here quoted Lucian's description of a painting by Apelles, which represented "Calumny":—

> "On the right sits a man with long ears, like those of Midas, holding out his hand towards the figure representing *Calumny*, who approaches him. Beside him stand two women, in whom *Ignorance* and *Suspicion* are personified. On the opposite side is *Calumny* herself, a woman of surpassing beauty; but here she is burning with anger and agitation, like one who cannot repress her rage and indignation. In her left hand is a flaming torch: with her right she drags along by the hair a boy, who stretches his hands to Heaven and calls the gods to witness. Then comes a man, pale and thin, with the cadaverous look of one wasted by long disease. That is *Envy*, and next appear two more women, pressing, decking, and adorning *Calumny*; they are called *Cunning* and *Deceit*. Behind them follows, poorly-clad in black and tattered garments, the figure of a woman, *Penitence* by name, who weeps and looks back, ashamed, to *Truth*, who follows her."

Except for the figure of *Penitence* and that of the boy imploring Heaven, both of which were emotional enough, the picture of Apelles would remind us rather of the "Pilgrim's Progress," or, more appropriately to the present question, it would recal a little-known book, the "Characters of Theophrastus." Theophrastus would be more or less a contemporary of the painter Apelles, and would represent the general taste of the times for the observation of character,—a taste which, though it perhaps never died out in any nation, yet had its times of ebb and flow. Strictly speaking, it might be said that the representation of character and of emotion were different things; and, what was at present more to the point, it might be said that the representation of both the one and the other in painting or in literature could not have more than a remote bearing on ancient sculpture. But he (the lecturer) was not so sure of that, for whatever was being done by contemporaries eminent in literature or in painting was done also, in their own way, by the sculptors. Why not, then, it might be asked, let Greek sculpture speak for itself? Unfortunately, Greek sculpture had been rendered dumb to a large extent by the loss and destruction of its greatest and noblest works. Passing on to notice the difference between the expression of character and that of emotion, the lecturer observed that the permanent character of a man was frequently revealed more strongly under emotion than otherwise. For that reason it was often difficult, in reading ancient descriptions of works of art, to make out how much or how little of the quality of emotion had been employed by the artist to help out his expression of character. Parrhasius, we were told by Pliny, painted a picture of the Athenian democracy in which he showed it to be variable of temper, angry, unjust, inconstant, and at the same time inexorable, clement, compassionate, self-glorious, proud, humble, fierce, slippery: in fact, "everything by turns and nothing long." We had to suppose that the Athenian *demos* was here represented by a single figure; but how so curious a complication of character could have been depicted in it was beyond comprehension, unless we assumed that his face was so conceived and so painted as to show a capacity for each and all of the various moods and emotions which had been mentioned. The remains of Greek sculpture which we now possessed afforded no large number of instances of emotional expression, except in minor or in later branches of the art. A well-known piece of sculpture mentioned by Homer ("Iliad," xxiv., 613) was the figure of Niobe cut in the rock on Mount Sipylos. According to the poet, she had been turned into stone by the gods, and there for ever sat brooding over her woes. Travellers found there still a figure cut into the rock, which, at a distance, had a resemblance to a woman. It was a figure of about 16 ft. in height, but the workmanship was too rude to give any evidence of a sculptor's talent; yet it might well be the Niobe of Homer. He need not have known how rudely it was cut; but it was certain that he believed the figure to be a woman expressing in her attitude the deep emotion of a mother who had lost at a moment her six brave sons and six fair daughters. Keeping still to Homer ("Iliad," xviii., 590) the lecturer instanced the chorus sculptured by Dædalus for Ariadne in Crete, representing youths and maidens as they danced hand-in-hand round in a semicircle in joyous spirits. It was not supposed that these emotions were expressed by the sculptor with the precision of modern art, or with the accuracy of the poet in observing them. Greek sculpture was then in its infancy; but the mere fact of attempting such a subject was evidence at least of its desire to render emotions. One of the oldest existing works of Greek sculpture, the frieze of a temple which stood at Assos in the Troad, was now to be seen in the Louvre, with the exception of some pieces found on the spot recently by an American expedition. The relief was very low, and in many places very carefully executed. On one slab Herakles was shown wrestling with the sea-god Nereus, to the astonishment of the sea-nymphs, who dreaded the consequences to their friend Nereus. Their manner of expressing astonishment and fear was to extend their hands with the palms wide open, to run away and yet to be unable not to look back. In conclusion, the lecturer instanced one of three surviving metopes from a temple at Selinus in Sicily, in which the subject represented is Perseus cutting off the head of the Gorgon Medusa, the sculptures of the Harpy Tomb, some slabs of the Phigaleian frieze, the sculptures of the Temple of Zeus at Olympia, and a bust of one of the fourteen statues lately found on the Acropolis at Athens, to the north-west of the Erechtheion, as each and all affording clear evidence, more or less pronounced in character, of successful efforts made by early Greek sculptors to express the emotions.

Mr. Murray's second lecture was delivered on Thursday evening last, and dealt with Greek sculptures of about the time of Pheidias. He commenced by asking his hearers to bear in mind the significant fact that though Pheidias was the first to introduce true largeness and dignity into sculpture, yet in respect of those two qualities of style he had been preceded by others in the sister art of painting, and in particular by the painter Polygnotus. If then, we might gather from the records of that painter any conspicuous evidence of an inclination towards expressing human emotions, it would not be unreasonable to bear that evidence in mind as an indication of the atmosphere in which Pheidias was brought up. He did not mean to argue that Pheidias was obliged to follow out every line of observation indicated by the great painter. On the contrary, it was likely enough, from all that was known of him, that he rather set himself to confine within narrower bounds the freedom of expression which the painter had indulged in. Sculpture had a different function from painting in those days. It was more in the service of religion, and thus,—even if it were known that Pheidias had in every instance severely repressed emotion in his figures, we should only be free to conclude that the occasion required so much,—not that he refused to recognise expression of the emotions as a legitimate channel of sculpture. As a matter of fact, we could not believe that his practice excluded a recognition of that view when we read ancient accounts of the impression made on spectators by his great statue of Zeus at Olympia. Of course, for a statue to make an impression was not exactly the same thing as to convey an expression. But it was worth observing that an artist, whether he were sculptor, painter, or poet, who produced a figure or a scene that moved us deeply, and yet was not itself moved, must possess the true creative faculty of anticipating our emotions,—must have himself gone through those very emotions in working out his conception. Returning to the painter Polygnotus, the lecturer said that the description had survived of two of his great paintings at Delphi, the one representing the taking of Troy, the other a visit of Ulysses to the Lower World, and what he saw there. In the former picture there must have been extremely little of emotion, as, indeed, might be expected considering that the subject was one in which emotion had passed over into action more or less violent, according to the general law laid down by Mr. Herbert Spencer, and accepted by Mr. Darwin, that "feeling passing a certain pitch habitually vents itself in bodily action." But in the picture of the visit to Hades all that was changed. There, action had ceased to be of any avail,—so much so, that Achilles would rather have been a day-labourer on earth than a prince in the Shades. There was, however, a compensating scope for emotion. Having described this picture, in which, he said, there must have been abundance of emotion expressed, the lecturer glanced at the poetry of Greece during the century that immediately preceded Pheidias, which, fragmentary as it deplorably was, contained much to convince us of the strength and force with which the emotions were expressed. Homer was then, and for long afterwards, the great school-book of the Greeks. It was because of him in particular that Plato wished all poets to be banished from his republic; and one of the strongest arguments for that purpose which he put into the mouth of Socrates was founded on those very Homeric passages where emotion was most strongly expressed. Socrates, though he had been trained from his childhood to love and revere Homer, thought it wrong that the sorrow and tears of great men should be exhibited. The blame of Socrates extended to Pindar and Æschylos, the actual poets of the time of which the lecturer was speaking. But we ought to take notice of the fact that the strong objections which Socrates urged against the poets in the matter of expressing the emotions were not held out by him as applying equally to the sculptors. Socrates had himself been trained as a sculptor, and might be presumed to have been familiar with the various characteristics of the art which he had abandoned for the pursuit of philosophy. He was acquainted, also, with painters and painting. What, then, were we to say of his silence in regard to these arts on the subject of expressing the emotions, so objectionable to him in the poets? In the first place it was Plato who made the objections, and not necessarily Socrates, though the words were put into his mouth. In the second place, it had always been a cause of surprise that a thinker like Plato, who combined the perfection of literary art with the most intricate of problems, should have passed over with so extremely little notice the great works of sculpture in the Athens of his day. There was no proof that he had any eye for them at all, and we could readily suppose that in avoiding criticism of them in reference to the emotions he was guided by the desire of not exposing himself to successful rejoinders. In any case his silence was not to be construed as proof that in his estimation the sculptors were altogether free from the charge which he had levelled at the poets. It was not, of course, possible for sculpture to go nearly the same length in that matter as a narrative poem like the Iliad. Sculpture was from its nature more organic, and had the forms and energy of actual life, and as such it appealed so vividly to the imagination that we could not allow any vagueness or inexactness of detail, any compensating here for what was left out there, such as there might be in some kinds of painting and of poetry. In sculpture, therefore, if there was to be emotion, it should be spread throughout the whole figure, or, in the case of a group, it should be diffused through the whole organism. It should be, so to speak, like the colouring matter of a plant, and should give the whole tone of the figure or group. The lecturer then called the attention of his audience to a slab from the west frieze of the Parthenon, which represented the youth of Athens starting and preparing to start on their ride to the Acropolis in one of the proudest ceremonies of their life. On such occasions there were always some too eager and some too slow. The young horseman on the slab in question was of the former class. He was placed at a point in the frieze where his impatience was easily intelligible, for just before him the great body of the cavalcade was breaking away at a gallop. He knew that there were some behind who had not yet mounted, and he had thrown himself round on his horse's back to urge them to make haste, which he had the more reason to do since just before him there stood one of the marshals of the procession, looking round attentively if not anxiously. On his head had been attached a metal wreath, now lost, and the usual explanation was that his left hand was raised in the act of placing the wreath on his head. He (Mr. Murray) could not agree with that explanation. The figure seemed rather to have thrown up his left hand in the act of urging forward his companions. Eagerness was marked in the whole movement of his body. The throwing-up of the arm was so completely part of that movement, and was so truly the very climax of the action, that the mere suggestion of its being due to the act of placing a wreath on the head was repugnant to the whole sentiment of the figure. The whole figure, including the face, was a noble expression of a fine emotion, and the more one realised the circumstances in which the youth was placed the more readily would that be seen. In Greek sculpture it was often difficult, if not impossible (and at the best it was always laborious) to realise the circumstances that were in an artist's mind and that were familiar enough to his contemporaries. Yet there were times when nothing was more necessary. We could do without it, or rather we had to do without it, in judging, for example, of one of the metopes of the Parthenon, which represented a Lapith suffering severe pain from the grasp which a Centaur has made at his throat. We knew the savage nature of the Centaurs, and we were told that the Lapiths were of a race, endowed with simple and noble natures, whose primitive function it was to subdue the more brutal elements of the world, represented by the Centaurs. It was essential, therefore, for the sculptor to give the Lapiths simple and noble forms, though in the particular metope referred to he had not succeeded to anything like the degree of his success in some of the others. But why, it might be asked, were the Lapiths always young in these metopes of the Parthenon, and in Greek sculpture generally of the good time, while the Centaurs were long-bearded and old? Apparently the intention of the artist was to bring out the contrast of a new race subduing and supplanting an older race. To the ordinary fancy of the Greeks it must have appeared at times that some of the Lapiths must have been old and some of the Centaurs young. Had the sculptors allowed their imagination the same licence the result would have been that they would have left us a record of what had been done by the Centaurs and Lapiths, or of what was believed to have been done by them; but they would not have told us *how* it was done. Therein lay the function of the artist, as Aristotle rightly observed, to tell *how* things were done, and not what things were done. As the lecturer had been led by these considerations away from the subject of emotion, he would go a step further and call attention to what seemed to him to be a curious difference of style in the sculpture of the Parthenon metopes. In another metope, which represents practically the same subject as the one before referred to, the Lapith and Centaur were massed together so as to present as large and as broad a surface to the light as possible, the shadow playing principally round the outer contours of the group. But such was not the case with the other metopes. There each limb had its true projection, its own light and shadow, and, so far, it must be allowed that the sculptor was in the right, considering their position on the Parthenon, exposed as they were to the full light of day. We must further suppose him to be right because it was in following out that principle that those other metopes were sculptured which had won the greatest praise. Still, there was a strong source of attraction in the other method which admitted of a softening and toning down of the action. It exposed to the light large surfaces which a gentle hand might modulate with a sunny pleasure in its ups and downs. It was high relief in a true sense, whereas the opposed principle was more nearly sculpture in the round. Having thus noticed some examples of the metopes and frieze of the Parthenon, the lecturer proceeded to discuss in detail the extent to which the groups of the pediments would serve the purpose of illustrating the expression of the emotions in sculpture. Was there any method or principle in allotting the sculptured decorations of the Parthenon which would enable one to forecast, from an emotional point of view, the character of the sculptures of the two pediments? He believed there was. Having described the frieze, the metopes, and the pediment groups, the lecturer said that they presented a series of opportunities for the expression of emotion. Among the sculptors older a little than Pheidias, a notice had been handed down of Pythagoras, and a statue which he made of Philoctetes suffering so badly from the wound in his foot that the spectators could not but feel the pain of it. It seemed strange to find a group of boys playing at knuckle-bones among the works by Polykleitos, the contemporary and rival of Pheidias. Obviously enough, such a subject could be treated so as to express strong or even violent emotion, as in the remains of a marble group in the British Museum, executed in Roman times, where the one boy was so far carried away as to bite the arm of the other. We might take it for certain that that was not the view of the subject chosen by Polykleitos, who was never in search of strongly-expressed emotion. The lecturer concluded with a notice of the works of another fellow-pupil and contemporary of Pheidias,—Myron,—whose well-known work, the "Discobolus," or disk thrower, did not express so much emotion in the face as might be expected, though it was a question whether we were justified in looking for any strong expression in the face in those instances where emotion was venting itself in action, as Mr. Herbert Spencer put it. Mention was also made of Myron's statue of Ladas, the celebrated runner, who was represented in the attitude of leaning forward to the goal; of that statue, a Greek epigram said that the sculptor had stamped the whole figure with expectancy of winning the Olympian crown. According to the writer of that epigram, then; the statue of Ladas was an instance of emotion forcibly expressed throughout the whole figure.

[Mr. Murray's third and concluding lecture of this course, to be delivered on Monday evening next, will deal with the works of sculptors subsequent to Pheidias.]

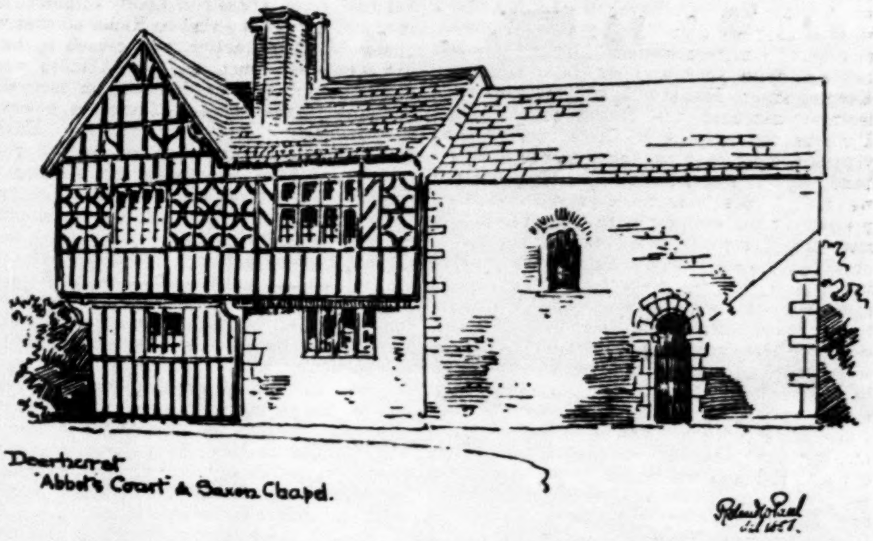
GLOUCESTERSHIRE.

WITH the exception of Tewkesbury and the cathedral cities of Gloucester and Bristol, this county may be said to be comparatively unknown to architects. Perhaps the fact of its being surrounded by rich districts,—Oxfordshire, Wilts, and Somerset,—may account for this to some extent. Nevertheless, there is much interesting work, both ecclesiastical and domestic. So much has been written about Tewkesbury, that it would seem difficult to say anything new. The chapel on the north side of the transept is interesting, however, as being in a somewhat similar position as what is known as the Elder Lady Chapel at Bristol Cathedral. At Bristol, it adjoins the east wall of the transept, and is approached from it, and also from the north aisle of the choir. At Tewkesbury, the chapel was built along the north side, the length of the nave coinciding with the breadth of the transept, and the chancel extending beyond it eastward. The nave has been destroyed, though the traces against the transept wall show it to have been of four bays. The chancel arch is double with a central column,—an unusual feature. This still remains. Both examples retain their wall arcading, the carving at Tewkesbury being much coarser in character than the beautiful spandrels at Bristol, so well known for their grotesques. Some colour remains at Tewkesbury, the spandrels having had a groundwork of blue and red.

The fine apsidal choir, with its radiating chapels, is seen to advantage from the private gardens on the north-east side (see lithograph plate), and the marks of the Lady Chapel eastward are still visible.

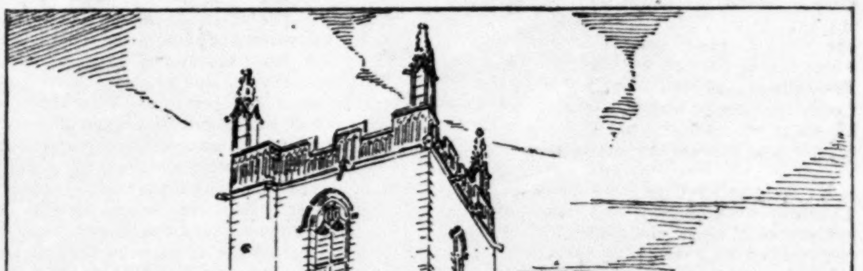
Amongst the wealth of shrines and tombs possessed by this abbey is one of late character, ascribed to Abbot Coates, in the south ambulatory of the choir, having a rich segmental band of vine-leaves, with dragons in the spandrels. The abbot's tomb of the fourteenth century, on the south side of the south choir aisle, is chiefly remarkable for the immense heavy-looking finial that surmounts it. Here, again, a comparison may be made with Bristol, where, in the sacristy,—also of fourteenth-century date,—the finials to the arcading and the spandrels have the same heavy appearance, and approach to coarseness,—a defect which cannot be charged against the Tewkesbury work.

From Tewkesbury it is three miles to Deerhurst, where is to be seen an interesting series of caps, which show the gradual development of the Early English foliage from the Norman cushion form. South-west of the church is a fine old timbered house, known as Abbots Court, and adjoining which is the Saxon Chapel recently discovered.



Deerhurst "Abbot's Court" & Saxon Chapel.

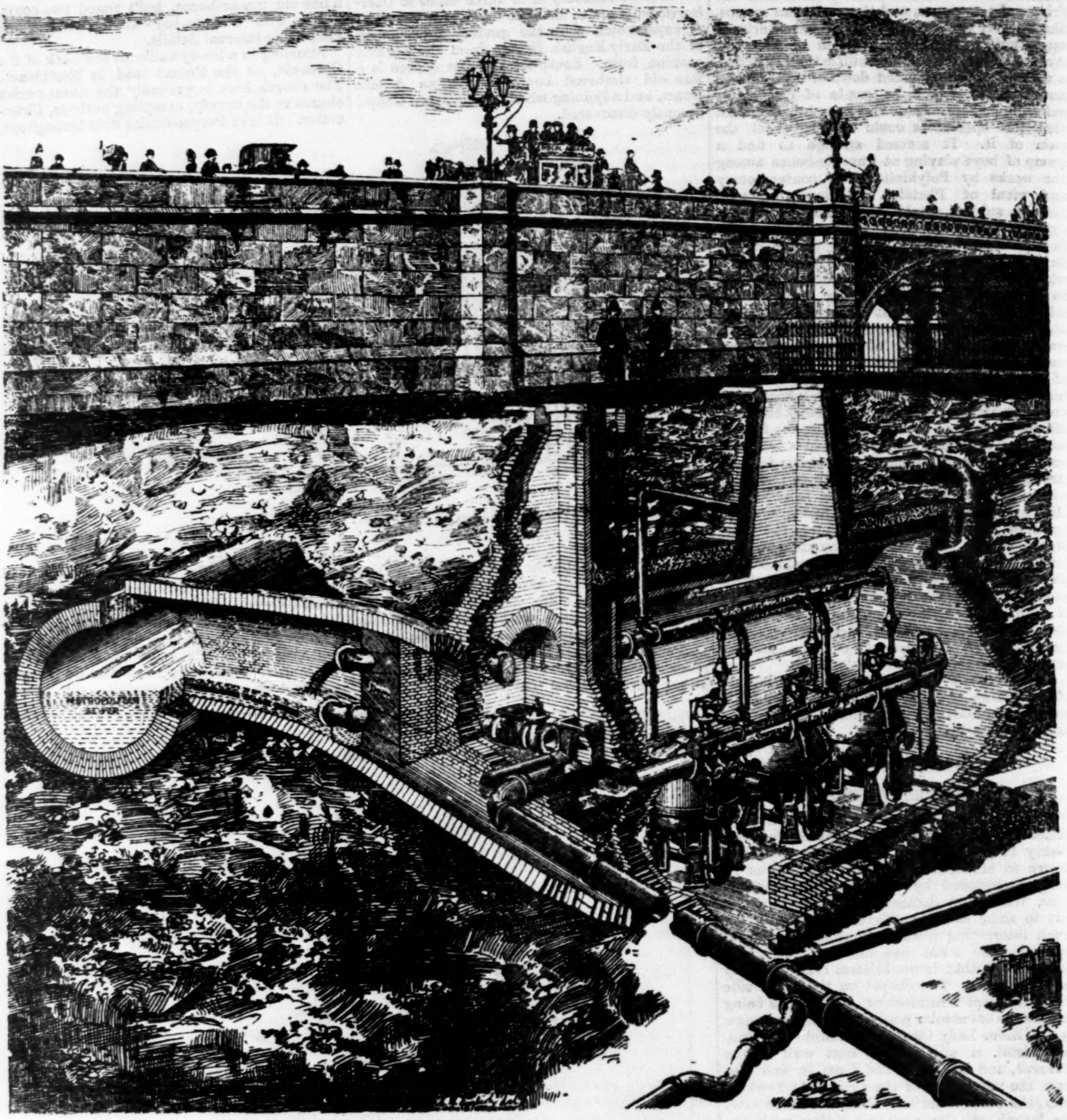
Across the country, at Stow-in-the-Wold, is a good church, finely situated on a hill, and visible for many miles. The early church of the thirteenth century has been destroyed, with the exception of the lower portion of the tower, and upon this has been raised a simple but very elegant Perpendicular superstructure of two stages, crowned by an embattled panelled parapet and angle pinnacles. Note the triangular stair lights. The tower is, as is often the case with early work, in an unusual position here, at the east end of the south aisle. The rest of the church is mainly Decorated, with later additions.



Stow-in-the-Wold.

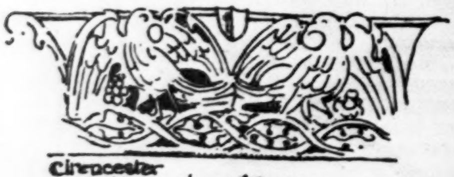
Near Stow is Icomb, or Iccomb, well worth a visit, for its perfect Early English church and a fine old manor-house, built round two courtyards, with a fine bay-window and many interesting internal details.

Standing in a lonely valley at the back of the Cotswold, on the Roman road, is Northleach. The church here is probably the finest parish church in the county, excepting perhaps, Cirencester. It is of Perpendicular date throughout, and is remarkable for the curious treatment of its western tower, the fine parvise porch, elaborately decorated with canopied niches and figure-work. Inside is some stained glass, the remains of a fine reredos in the south aisle, good sedilia, and a font of the same date as the church. Both Northleach and Cirencester possess very good stone pulpits, the former more nearly approaching the type found in Somersetshire. In the Cirencester example the sides are pierced above the floor-level. Cirencester is rich in screen-work, the chancel screen having an excellent cresting of birds, and the parclose screen, known as the "Jesus Chapel," in St. Mary's Chapel, should not be overlooked.



The New Drainage Works at the Houses of Parliament.—Sectional Perspective View of the Pneumatic Ejector Chamber.

No architectural visitor in Gloucestershire should pass over the fine old church at Berkeley, with its well-proportioned arcade, its stone rood-screen, and the mortuary chapel of the Berkeleys on the south side of the chancel, which, owing to the exigencies of the site, is not a rectangle, the south wall canting north-east, making it narrower at the east end than at the west. The chapel has its own stone screen dividing it into nave and chancel, and a curious arrangement of squints allows the chapel altar to be seen from the nave of the church, whilst another gives a view of the high altar from the chapel. The tomb of James, eleventh Lord Berkeley, is rich in figure sculpture; amongst them a good St. George and the Dragon. Outside, on one of the pinnacles, is the same saint, elaborately worked amongst the crockets, and in richness of effect reminding one of the appearance of the work at Rosslyn, near Edinburgh.



Cirencester
cresting of chancel screen.

In various parts of the country are to be found fine examples of Domestic work: Southam House, near Cheltenham; Icomb Place, Berkeley Castle, Wanswell Court, Iron Acton, Little Sodbury (with a fine hall and oriel), and last but not least, Thornbury Castle, are all worthy of close inspection.

Surveyors' District Map.—If we may judge by letters that have reached us, the Map of London, showing the boundaries of the Surveyors' districts, which we issued with the first four numbers of the present volume, is likely to prove as useful to architects and builders as we hoped would be the case. The Publisher has now made arrangements for mounting the sheets on strainers or rollers, for convenience of reference, as to which particulars will be found in our advertisement columns.

Death of Sir Joseph Whitworth.—Mechanical science has sustained a great loss by the death of Sir Joseph Whitworth (which occurred at Monte Carlo), but, as we need hardly say, it has gained greatly by his life's work.

THE NEW DRAINAGE WORKS AT THE HOUSES OF PARLIAMENT.

On Tuesday last we were enabled to inspect the new drainage works at the Houses of Parliament, which, however, are only completed in detail for a portion of the buildings, leaving the remainder of the work to be done in future recesses. But, as will be seen by the following particulars, for which we are mainly indebted to a pamphlet issued by the engineer of the works, Mr. Isaac Shone, the main part of the work has been done, and the source of the evil smells which have been so noticeable until lately within the building and its precincts has been removed.

It appears that in 1839 Sir Charles Barry laid down, under the middle of the Houses of Parliament, from north to south, a large, nearly-flat-bottomed brick sewer, which discharged into a similarly constructed sewer in Abingdon-street, near the Victoria Tower. This sewer, owing to its bad form, excessive size, little fall, and absence of any means for flushing it, accumulated a large amount of sewage deposit, the gaseous emanations from which continually polluted the air of the Palace. In 1846 the smells from the Palace sewer were so bad that Sir Charles Barry consulted Mr. John Phillips, C.E., who was then the Chief Surveyor to the Westminster Commissioners of Sewers, with a view to its improvement. Mr. Phillips, after examining the sewer, recommended that a narrow, deeply-curved invert, with a reversed fall, should be substituted for the old invert, and that it should be continued northward, across the Speaker's Green, into the outlet of a sewer in Bridge-street, which latter he found to be about 5 ft. lower than the sewer in Abingdon-street. Sir Charles Barry not only adopted and carried out these recommendations, but the increased depth enabled him to construct two main branch drains from near the lower end of the new portion of the sewer, for draining the east and west sides of the Palace at a much lower level than they were originally. By the better gradient thus obtained, and by the narrow and deeply-curved invert put in, the sewer, as altered, supplemented with ample flushing power, became self-cleansing, and it continued in this improved condition for a quarter of a century,—until twelve or thirteen years ago. At that time,—about 1873,—the Metropolitan Low Level Sewer, 7 ft. 9 in. in diameter, was put down through Westminster, and the Palace sewer was connected with it, its bottom at the junction being about 21 in. above the bottom of the Metropolitan Low Level Sewer. Ever since this work was done there has been daily, in dry weather, from 3 ft. 6 in. to 4 ft. in depth of sewage flowing on the bottom of the Metropolitan Low Level Sewer, and this created a constant head of sewage against the Palace sewer outlet, converting it into a creek for a length of about 200 ft., containing from 1 ft. 9 in. to 2 ft. 3 in. in depth of nearly stagnant sewage, which was always present upon the bottom of the Palace sewer. But, besides this, in wet weather the Metropolitan sewer was not only always filled with sewage water, but sometimes this water has risen to 10 ft. above the crown of the metropolitan sewer, or 13 ft. above Ordnance datum. During wet weather, therefore, the Palace sewer and its main branch drains have been filled with sewage and rain-water, which could not be discharged until the flood-water contained in the Metropolitan Low Level Sewer had subsided, by being cleared out by the pumps at Abbey Mills, Bow, and by running it off through the sluices at Blackfriars and elsewhere into the Thames. Hence, for twelve or thirteen years past the Palace sewer, as well as its main branch drains, have been periodically converted into a series of sewage reservoirs; and from these the sewage water, as it accumulated and filled them, pressed out the foul gases contained within them, up the various contributing drains into the palace. This discharge of sewage-gas into the Palace has been going on more particularly at night-time, during the Sessions of Parliament, when the gas has been burning throughout the Palace, and when the waste hot-water and steam from the warming and ventilating appliances of the Palace were discharged into the drains and sewers, and fermented the sewage lying therein. In the early part of 1886 a Committee was appointed, Sir Henry E. Roscoe, F.R.S., being the chairman. One of the members of this Committee, Mr. L. H. Isaacs, fortunately had a thorough practical knowledge of the subject upon which they were asked to report. He deemed it desirable personally to examine the interior of the main sewer under the Palace, from the Victoria Tower to the point of discharge at the Speaker's-green; and, having regard to the then state of the main sewer, this was a disagreeable, not to say courageous, work to undertake. At the termination of his subterranean survey he presented himself as a witness, and deposed to the state of things which he found to exist beneath the Palace. Subsequently, he repeated his examination of the main sewer, and deposed a second time to what he had seen. Mr. John Phillips, who had had a large practical experience as a sanitary engineer, and who had advised Sir Charles Barry as to the improvements which were effected in the drainage of the Palace about 1848, as already mentioned, was also asked to give evidence before the Committee. With that object Mr. Phillips made examinations of the sewer, and of some of the branch drains, under the Palace, and endorsed the views of Mr. Isaacs in regard to the faulty character of the same. He subsequently, from his special knowledge of the circumstances connected with the drainage arrangements both inside and outside the Palace, submitted to the Committee a plan for again improving the main sewerage arrangements of the Palace, and rendering them perfectly independent of the metropolitan low-level sewer as a means of discharge by gravitation. This plan was supported by Major Hector Tulloch, R.E., Local Government Board Inspector, who had previously reported to the President of the Local Government Board upon the defects of the drainage of the Houses of Parliament. The Committee, after due consideration of the subject in all its bearings, recommended Parliament that the plan, as proposed by Mr. Phillips, on the Shone Hydro-Pneumatic System, should be adopted; and their recommendations have been substantially carried into effect.

On the preceding page is a sectional perspective view of the pneumatic ejector station, looking from the base of the Clock Tower in the direction of Westminster Bridge. Fig. 1 on the smaller diagram is a cross-section of the 1839 sewer, showing, by black colour, the invert waterway necessary to pass through it the maximum quantity of sewage obtaining at the Palace when Parliament is in Session. The original sewer had a gradient of 1 in 923 only, but by the alteration suggested by Mr. Phillips in 1846 it was increased in 1848 to 1 in 215.

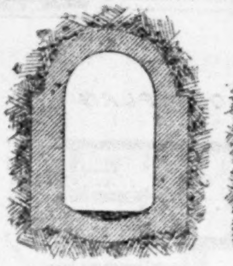


Fig. 1.

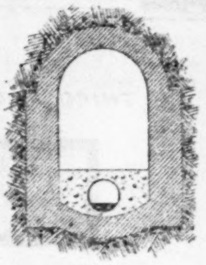


Fig. 2.

The new works, briefly described, consist (1) in improving the gradients of the main sewer and its principal tributaries; (2) in reducing the sizes of the sewers,—the main sewer, for example, from 10 ft. 6 in. high by 3 ft. wide, to one of 12 in. in diameter, as illustrated by fig. 2; this latter figure also shows the waterway on the invert of the new main sewer, with its improved gradient, when that sewer is charged with the maximum quantity of sewage which obtains during the Parliamentary session. The chief tributary is reduced from 24 in. high by 15 in. wide, and laid at an average gradient of 1 in 372, to a pipe sewer of 9 in. in diameter, laid at a gradient of 1 in 309; (3) in providing superior flushing appliances (Shone's automatic hydraulic flushing ejectors) for the sewers, at a considerably reduced expenditure of water; (4) in providing an improved method of ventilating the main sewers; (5) in forming proper connexions between the drains and the main sewers, and giving facilities for inspection at the junctions; (6) in severing absolutely the large tunnel-like connexion between the Palace sewer and the metropolitan low-level sewer by means of a dam of brickwork shown in the sectional perspective view; in dispensing with the big cumbrous penstocks and flap-valve arrangements connected therewith, and substituting therefor a small 12-inch iron sewer, with sluice and reflux valve; (7) in providing, in case of need, improved automatic arrangements for permitting the palace sewage and rainfall to flow into the metropolitan low-level sewer by gravitation, on the principle heretofore adopted, independently altogether of the ejector system, but without the possibility of the foul gases from the metropolitan low-level sewer getting into the palace sewer; (8) in preventing the hot water and steam from the boilers, &c., from passing into the drains and sewers, and providing a separate and independent outlet for same into the Thames; (9) in providing means whereby the sewage and rainfall proceeding from the Houses of Parliament shall flow uninterruptedly therefrom both in dry and wet weather, irrespective of the height at which the metropolitan low-level sewer is discharging sewage, or sewage and rainfall in combination. This latter *desideratum* is effected by means of Shone's pneumatic sewage ejectors, which are fixed in a chamber (the interior of which is shown in the view) under the Speaker's Green, near the Clock Tower. These ejectors are placed below the level of the Houses of Parliament main sewer, so that the sewage and rainfall flows to and into them by gravitation. There are three ejectors, one of 500 and two of 350 gallons capacity. They can be worked separately or unitedly, just as the flow of sewage or rainfall is small or large.

The compressed air required by the ejectors to expel the sewage and rainfall is supplied by air-compressers, driven by Atkinson's patent differential gas engines. There are four of these (of 4-horse power each) situated in the basement of the palace, about 650 ft. from the ejector station. The minimum and maximum quantities of sewage, and sewage and rainfall together, it is now difficult to estimate; but as one of Kaiser's patent counters is attached to each ejector, a practically accurate record can be kept of the quantities that will be received and ejected from time to time. When one engine and one ejector are insufficient, during periods of extraordinarily excessive rainfall, there is a float within the sewage manhole, adjacent to the ejector-chamber, which will rise and fall with the sewage and rainfall, and which will actuate one of Mr. Julius Sax's automatic electrical tidal water gauges. This apparatus is fixed within the ejector-chamber, and a duplicate of it is also fixed in the gas-engine room, both being very effectively operated simultaneously by the float. These instruments have faces resembling ordinary clocks, and the hands on them denote the exact level, in inches, of the water in the sewage manholes, from which the ejectors are supplied. The moment one engine is overcome the electrical apparatus rings a bell within the ejector-chamber, and in the gas-engine room, at one and the same instant, and then the attendant will set a second gas engine to work; but if the sewage continues to rise in the sewage manhole, notwithstanding the setting to work of a second engine, the electrical apparatus will continue to indicate such increased height, and the attendant will then put a third, and, if necessary, the fourth gas engine to work.

The works were divided into three contracts, the general contract (No. 1) being let to Messrs. John Mowlem & Co., of Westminster; and the special contracts (No. 2), embracing the supplying and fixing of the pneumatic and hydraulic ejectors, to Messrs. Hughes & Lancaster, Chester; and (No. 3) for the supply and erection of the gas-engine air-compressors, to the British Gas-Engine and Engineering Company, Queen Victoria-street, London. The cost of these special works has been about 11,000*l*., but other works in connexion with them have been done by Messrs. Perry & Co., contractors, under the direction of Mr. John Taylor, of the Office of Works. The plumbing work has been done by Messrs. Dent & Hellyer. The whole of the work has been carried out under the general supervision of Mr. T. J. Jones, the Clerk of Works at the House of Commons.

Illustrations.

"SPRING TIME": DECORATIVE DESIGN.

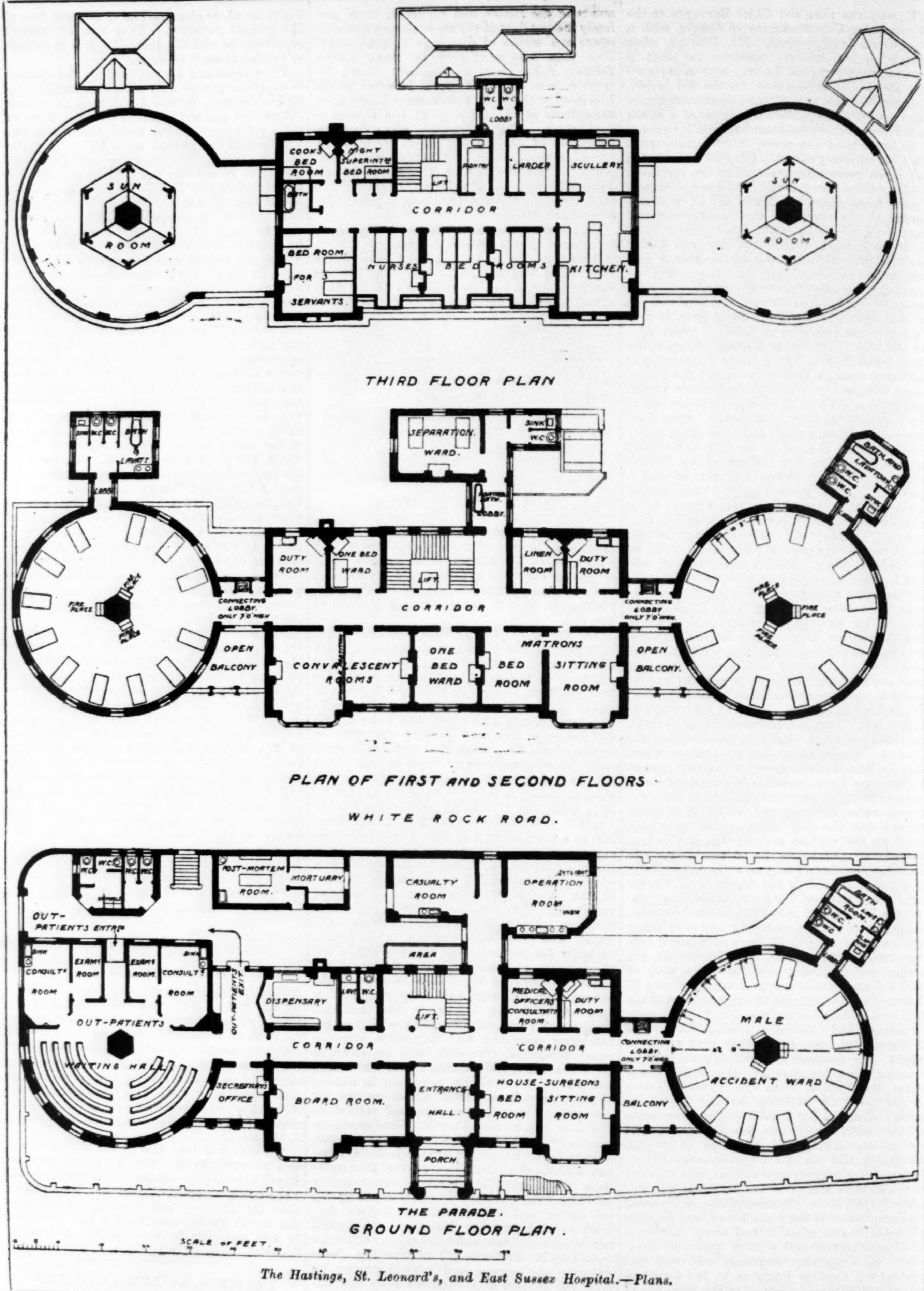
THIS design is the one which obtained the prize for decorative design in the Royal Academy Students' Competition for 1886, as mentioned by us at the time the designs were publicly exhibited. It was one of the few which fulfilled the proper requirements of mural decoration, being composed in one plane, and in a light key, and without any attempt at effects proper only to oil painting and easel pictures. The designer is Mr. Herbert J. Draper.

We may add that this is the design which was referred to by the President of the Royal Academy in his address to the students, when he congratulated them that, for the first time, the Academy had been able to commission one of the students' designs for execution. It will probably be executed in a London Hospital.

HASTINGS, ST. LEONARD'S, AND EAST SUSSEX HOSPITAL.

IN December, 1884, we illustrated the designs for this hospital which had been prepared by Messrs. Young & Hall, and which had obtained the approval and sanction of the committee. The committee, however, failed to obtain the necessary funds, and the whole matter remained in abeyance.

In the early part of last year it was decided to considerably modify the original scheme for the new hospital, and plans on a much-reduced


SUN ROOM
COOKS BED ROOM
NIGHT SUPERINTts BED ROOM
LIFT
PANTRY
LARDER
SCULLERY
W.C.
LOBBY
CORRIDOR
BED ROOM FOR SERVANTS
NURSES BED ROOMS
KITCHEN
THIRD FLOOR PLAN
SEPARATION WARD
SINK
W.C.
BATH
LOBBY
DUTY ROOM
ONE BED WARD
LIFT
LINEN ROOM
DUTY ROOM
BATH AND LAVATORY
FIRE PLACE
CONNECTING LOBBY ONLY 7'0" HIGH
CORRIDOR
OPEN BALCONY
CONVALESCENT ROOMS
ONE BED WARD
MATRONS BED ROOM
SITTING ROOM
OPEN BALCONY
PLAN OF FIRST AND SECOND FLOORS
WHITE ROCK ROAD
W.C.
POST-MORTEM ROOM
MORTUARY
CASUALTY ROOM
OPERATION ROOM
OUT-PATIENTS ENTRce
CONSULTG ROOM
EXAMG ROOM
EXAMG ROOM
CONSULTG ROOM
OUT-PATIENTS EXIT
AREA
DISPENSARY
LAV
W.C.
LIFT
MEDICAL OFFICERS CONSULTNTS ROOM
DUTY ROOM
BATH ROOM
OUT-PATIENTS
WAITING HALL
CORRIDOR
CORRIDOR
CONNECTING LOBBY ONLY 7'0" HIGH
MALE
ACCIDENT WARD
SECRETARYS OFFICE
BOARD ROOM
ENTRANCE HALL
HOUSE-SURGEONS BED ROOM
SITTING ROOM
BALCONY
PORCH
THE PARADE.
GROUND FLOOR PLAN.
SCALE OF FEET

The Hastings, St. Leonard's, and East Sussex Hospital.—Plans.

scale were accordingly prepared by the architects, Messrs. Young & Hall. Two schemes were submitted for the approval of the committee,—one having wards of the usual form, the other having wards of a circular form, a system which owes its origin to the eminent surgeon, Professor John Marshall, F.R.S.

Several members of the committee and of the medical staff having visited the Miller Memorial Hospital at Greenwich, which (the first hospital with circular wards erected in this country) had recently been completed from the design of Messrs. Young & Hall, the circular system was, after much discussion, finally adopted, and the designs from which the present hospital is being erected were definitively approved.

The building is planned to accommodate sixty-eight patients in five circular wards of twelve patients each, four wards of one bed each, and two separation wards of two beds each.

The central portion contains the general administration offices, with rooms for the resident medical officer, matron, nurses, and servants. The kitchen is placed on the top floor, and will be fitted with a complete gas-cooking apparatus by Messrs. James Slater & Co.

The wards are connected to the administrative department by means of corridors which are

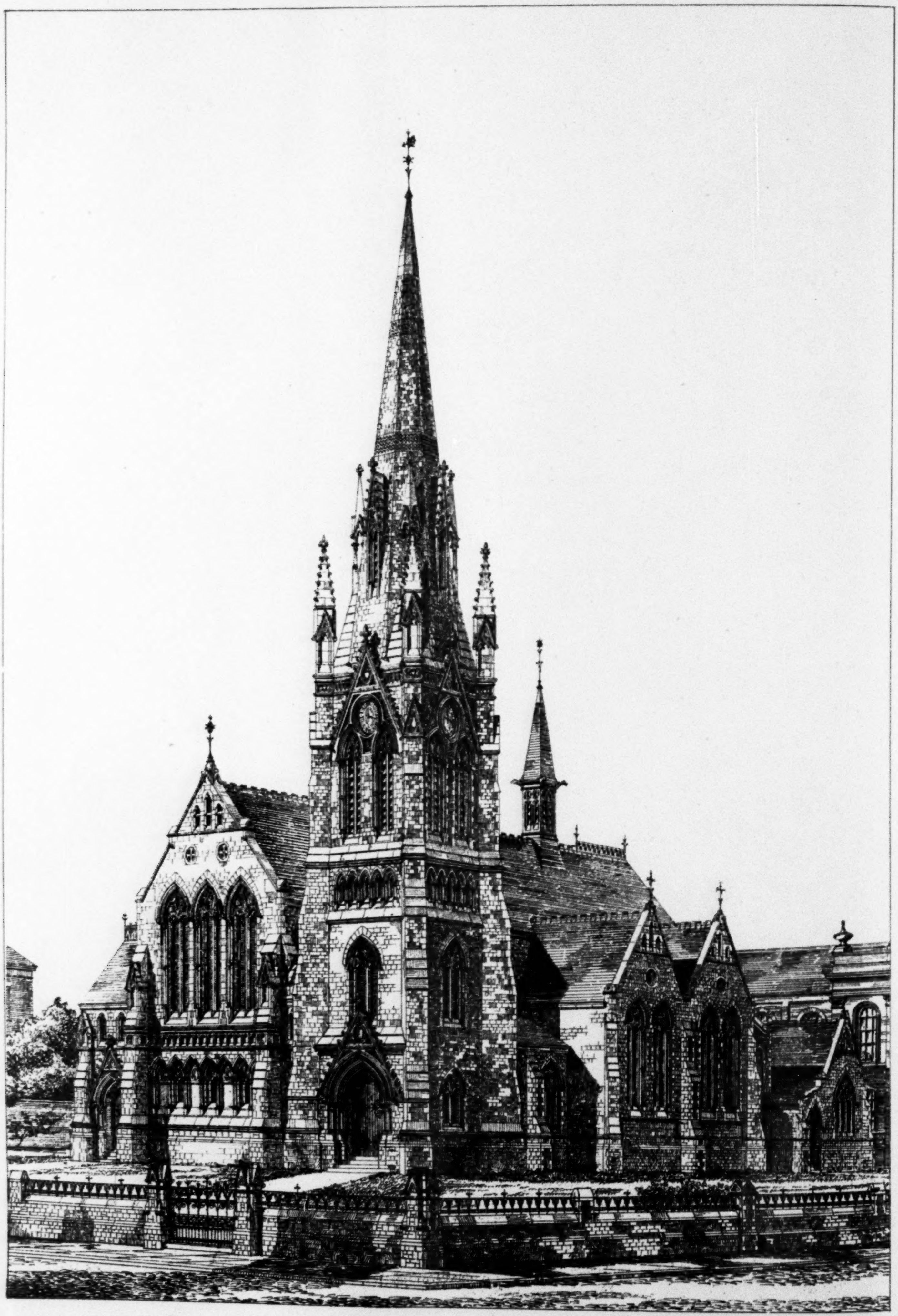


PHOTO-LITHO, SPRAGUE & Co. 22, MARTINS LANE, CANNON ST. LONDON, E.C.

NEW CONGREGATIONAL CHURCH, WEST CROYDON.—Mr. W. D. Church, Architect.

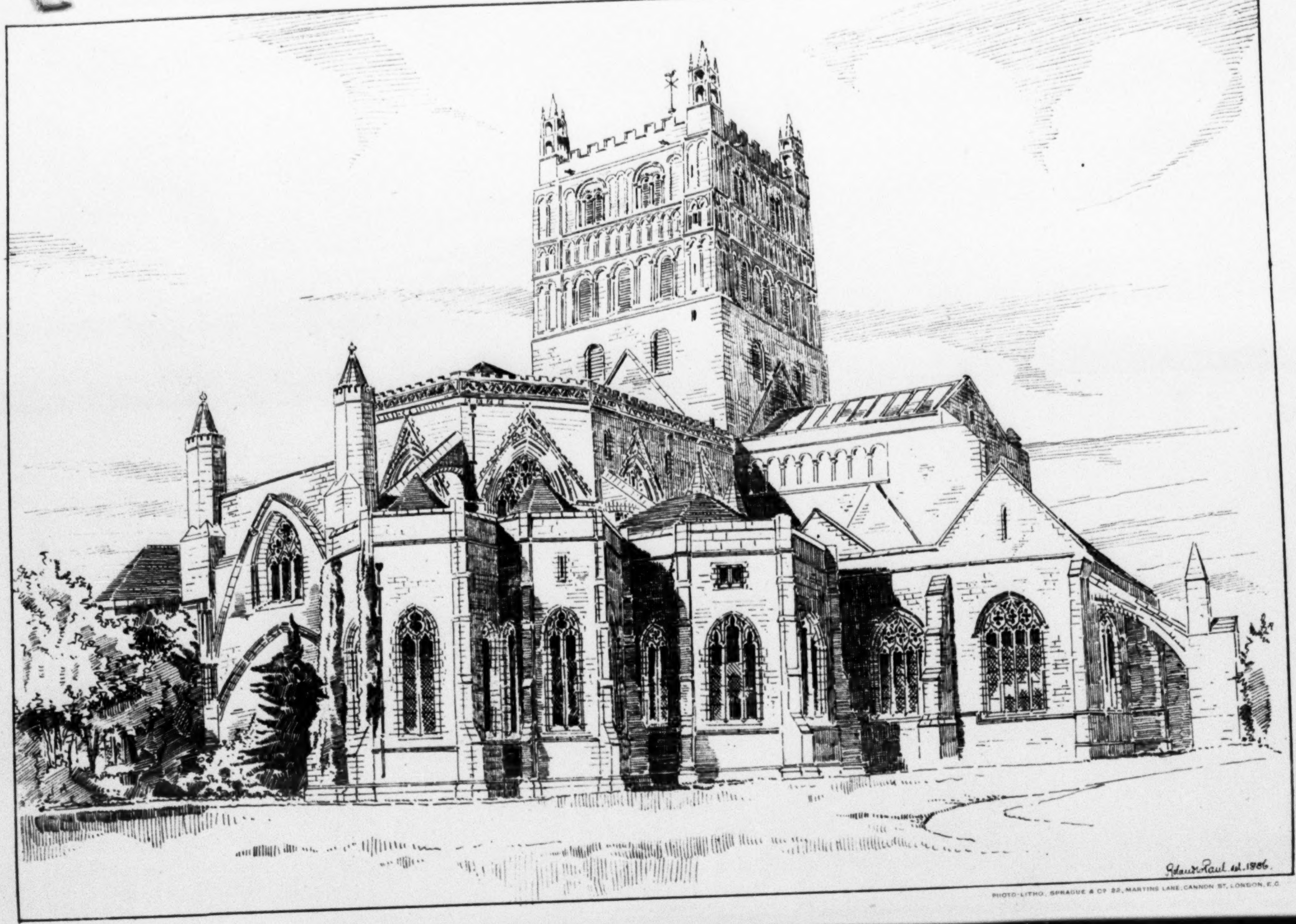
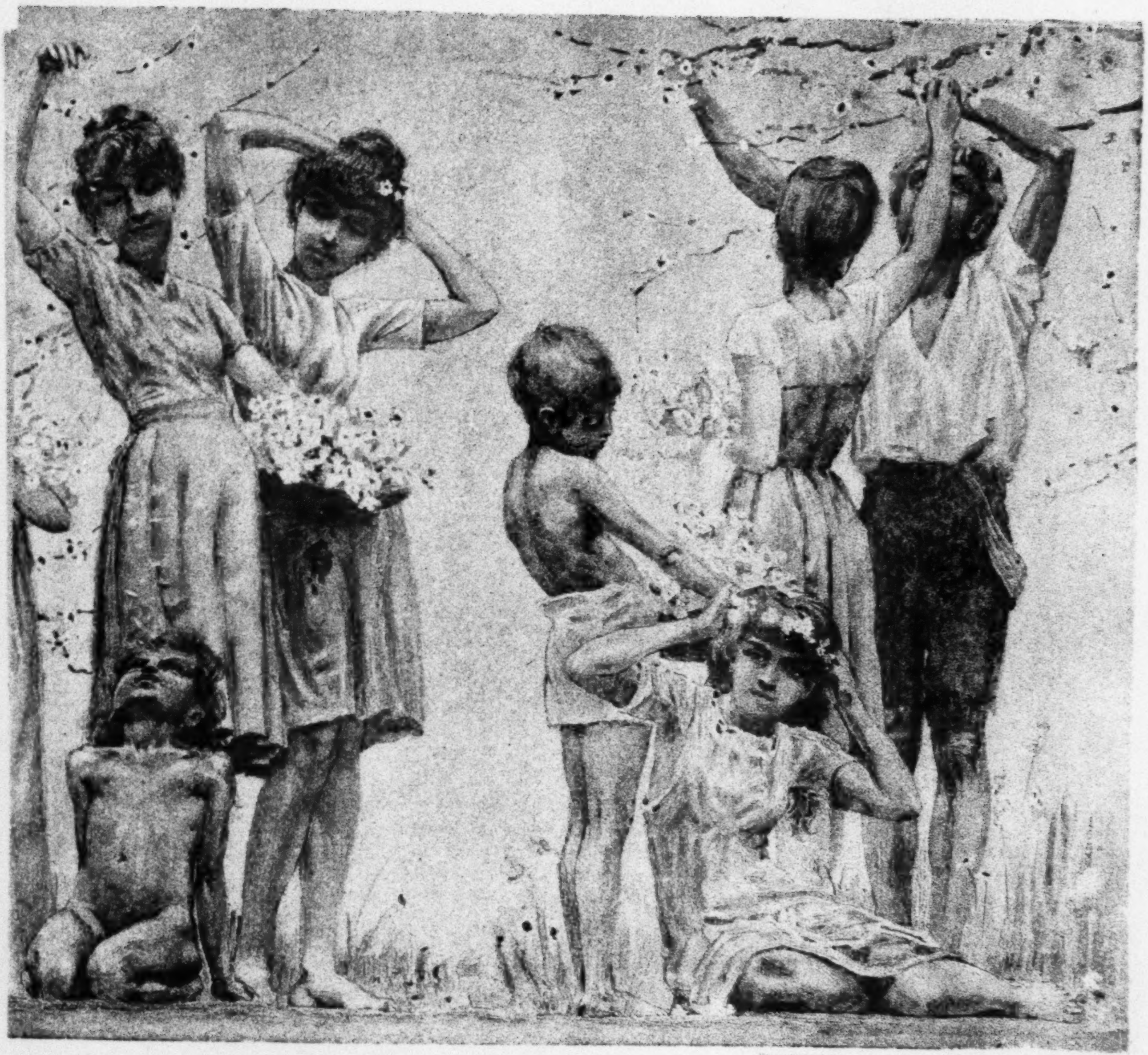

Roland Paul del. 1886.

PHOTO-LITHO, SPRAGUE & Cº 22, MARTINS LANE, CANNON ST, LONDON, E.C.

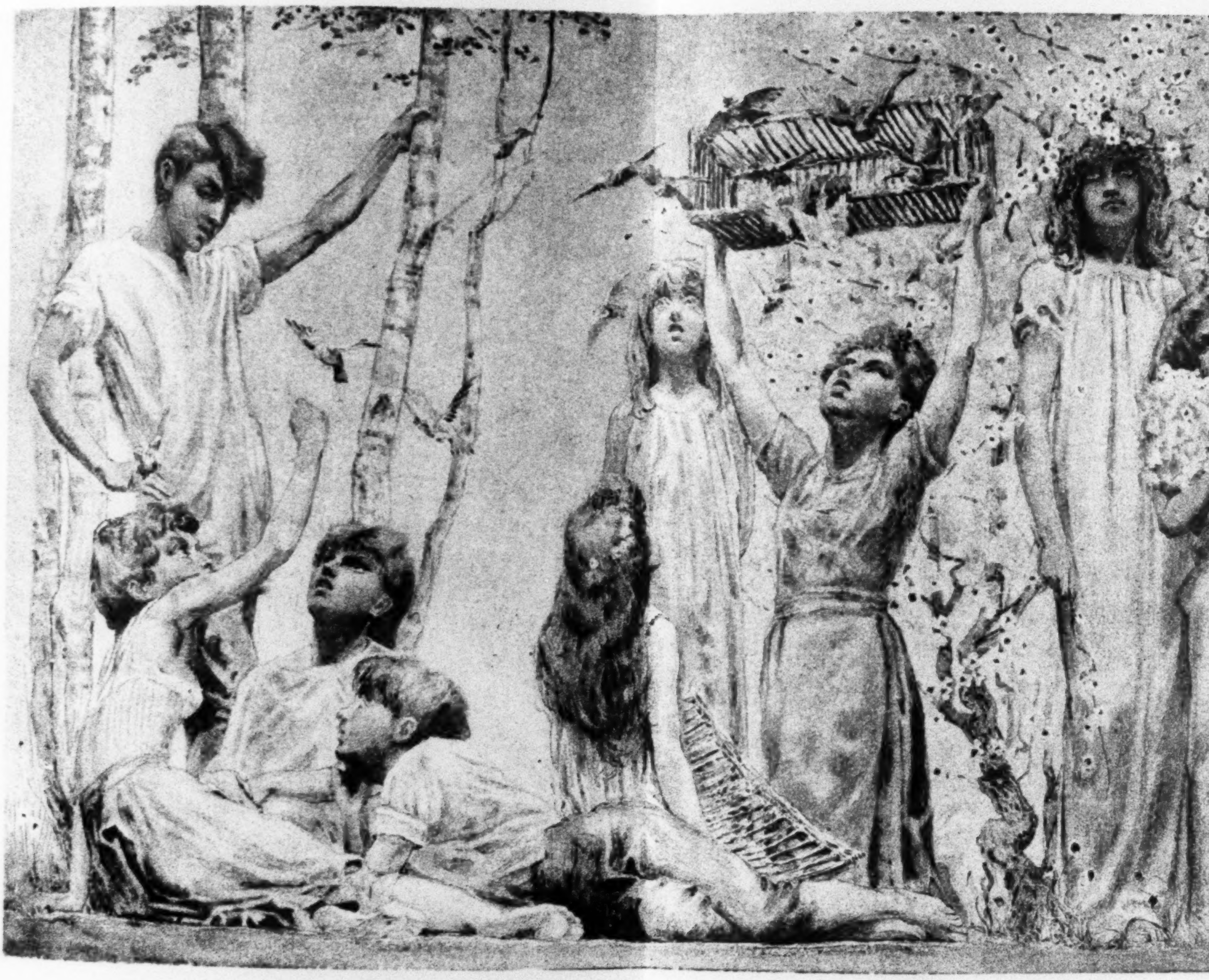


"INK-PHOTO" SPRAGUE & Cº 22, MARTINS LANE, CANNON Sᵀ LONDON. E.C.

Herbert J. Draper.

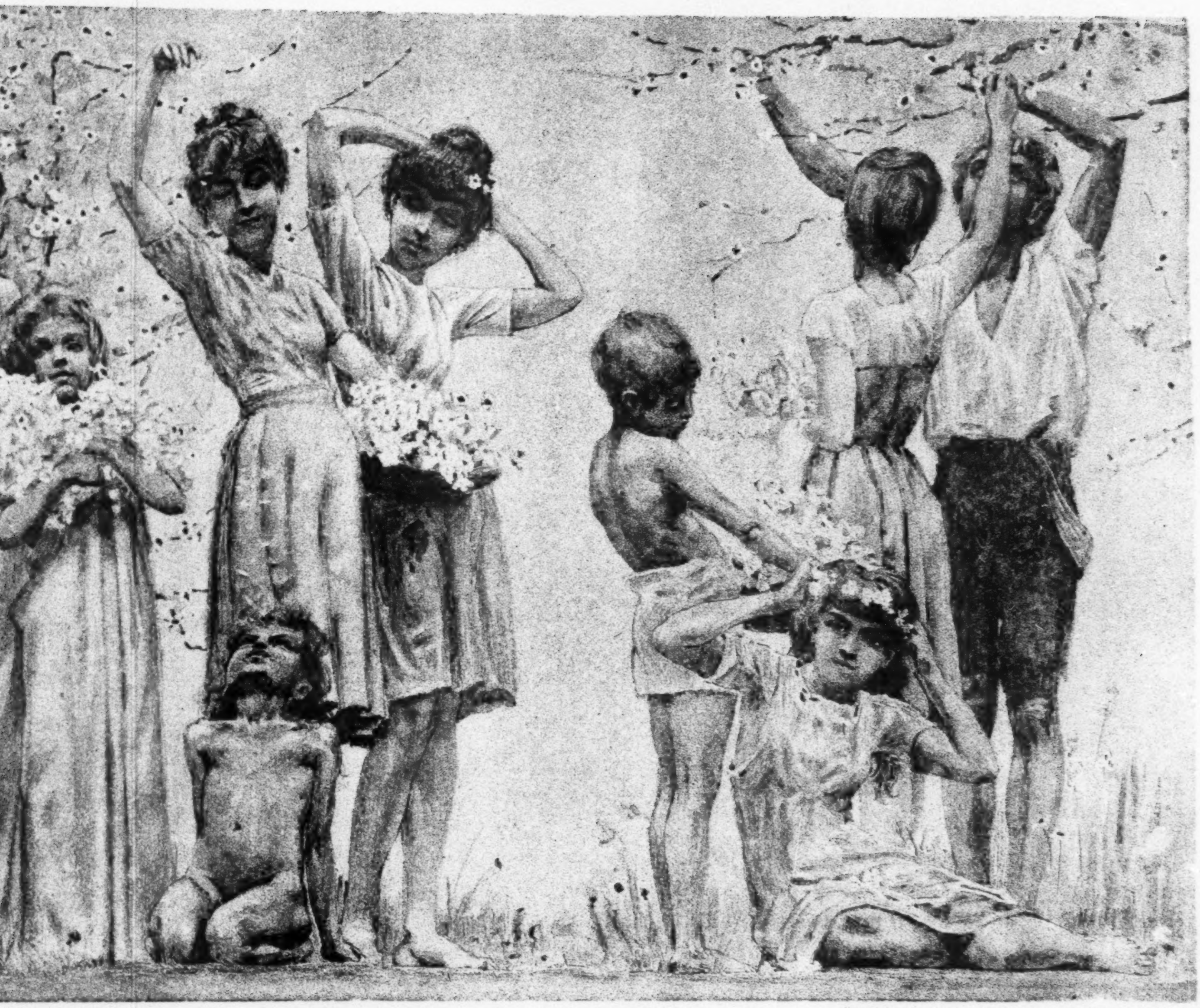
zar

TEWKESBURY ABBEY FROM NORTH EAST.



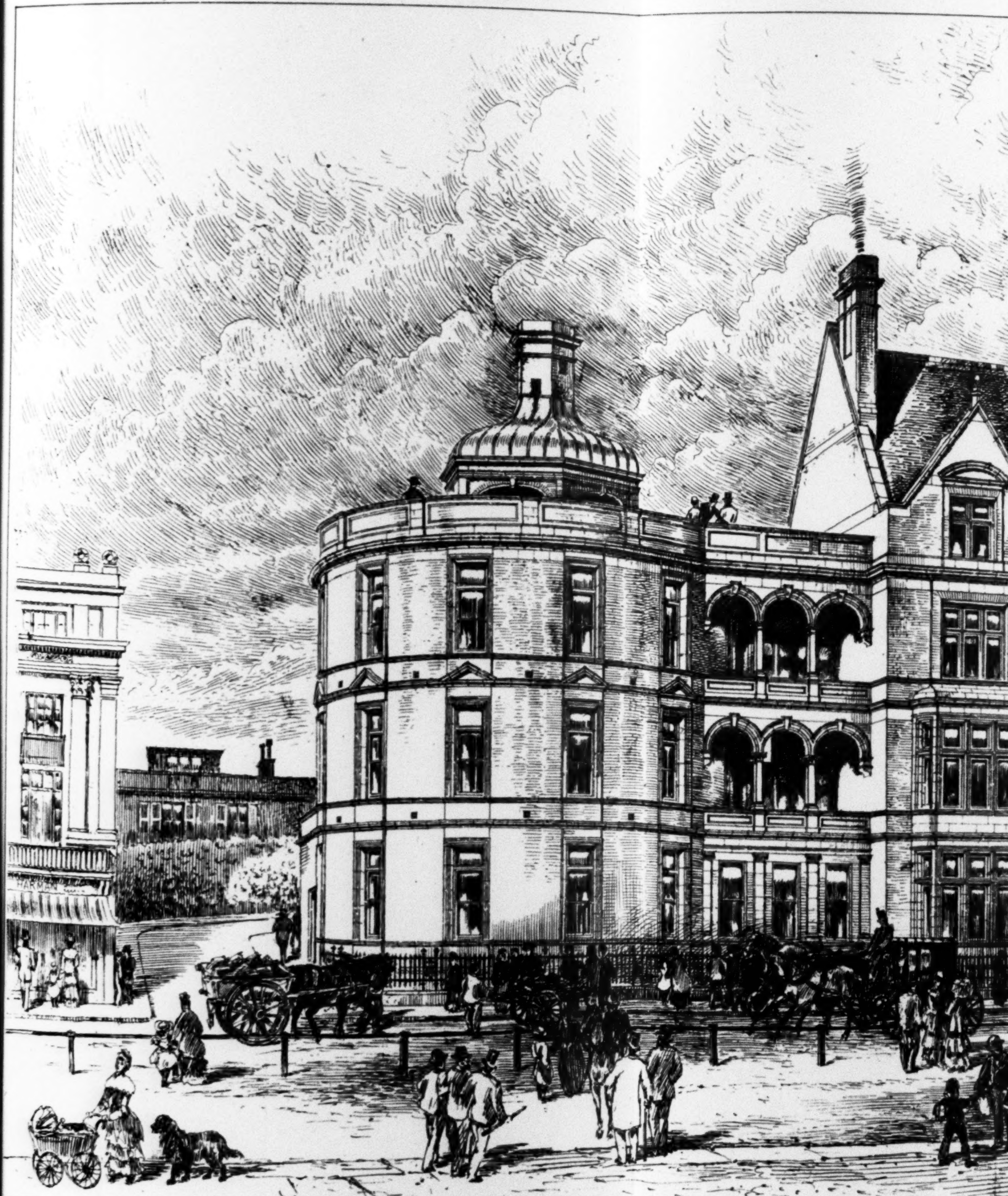
"SPRING TIME": DECORATIVE DESIGN

warded Prize for Decorative Design, Royal Academy, 1886.



INK-PHOTO. SPRAGUE & Co 22, MARTINS LANE, CANNON St LONDON. E.C.

ESIGN BY MR. HERBERT J. DRAPER.



THE HASTINGS, ST. LEONARDS AND EAST SUSSEX HOSPITAL.—Mr. K

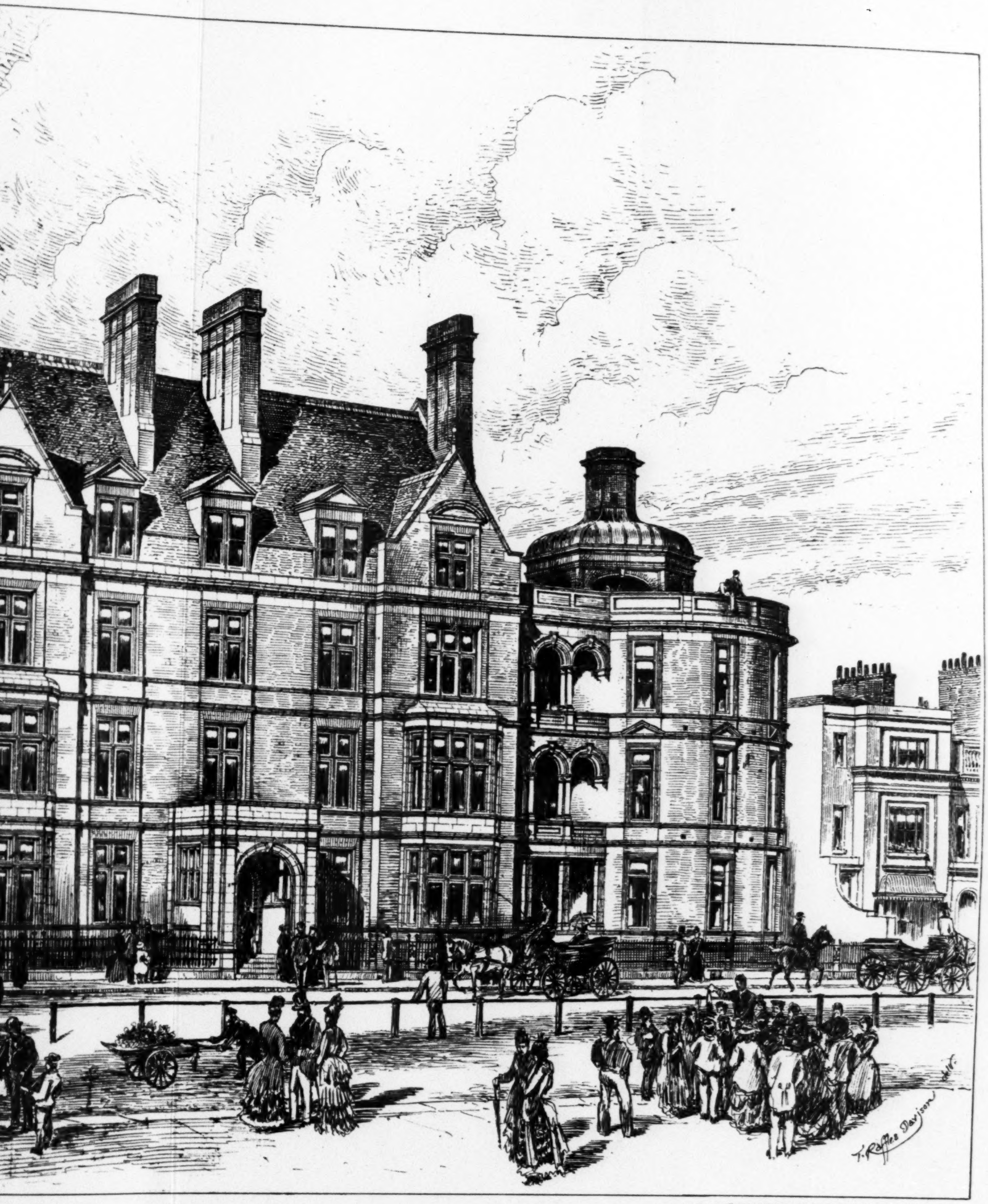
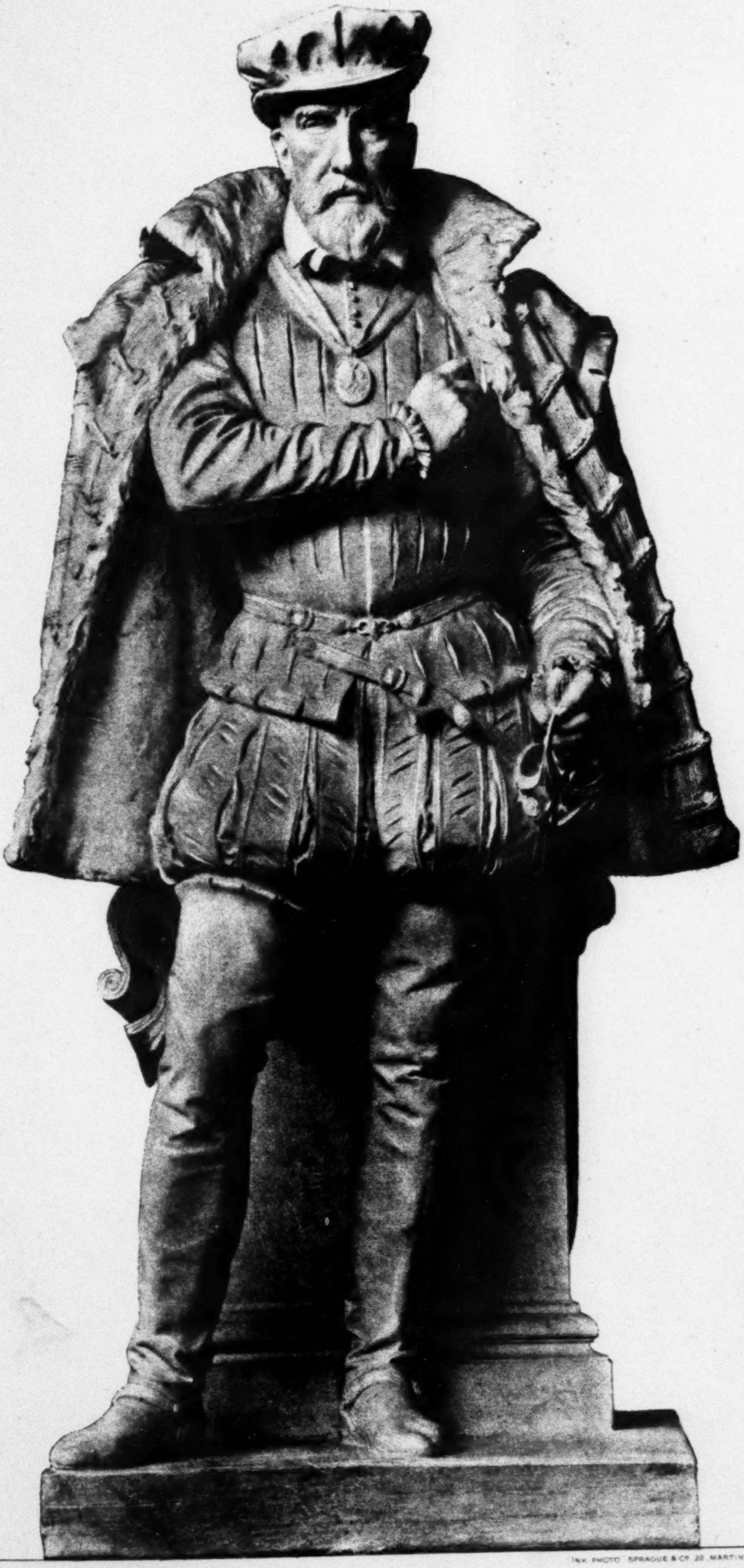

T. Raffles Davison
del.

PHOTO-LITHO. SPRAGUE & Cº. 22, MARTINS LANE, CANNON Sᵀ. LONDON E.C.

. Keith D. Young, F.R.I.B.A., and Mr. Henry Hall, A.R.I.B.A., Architects.



INK PHOTO SPRAGUE & CO 22, MARTINS LANE, CANNON ST LONDON E.C.

STATUE OF ADMIRAL COLIGNY, TO BE ERECTED AT PARIS.—M. CRANK, SCULPTOR.

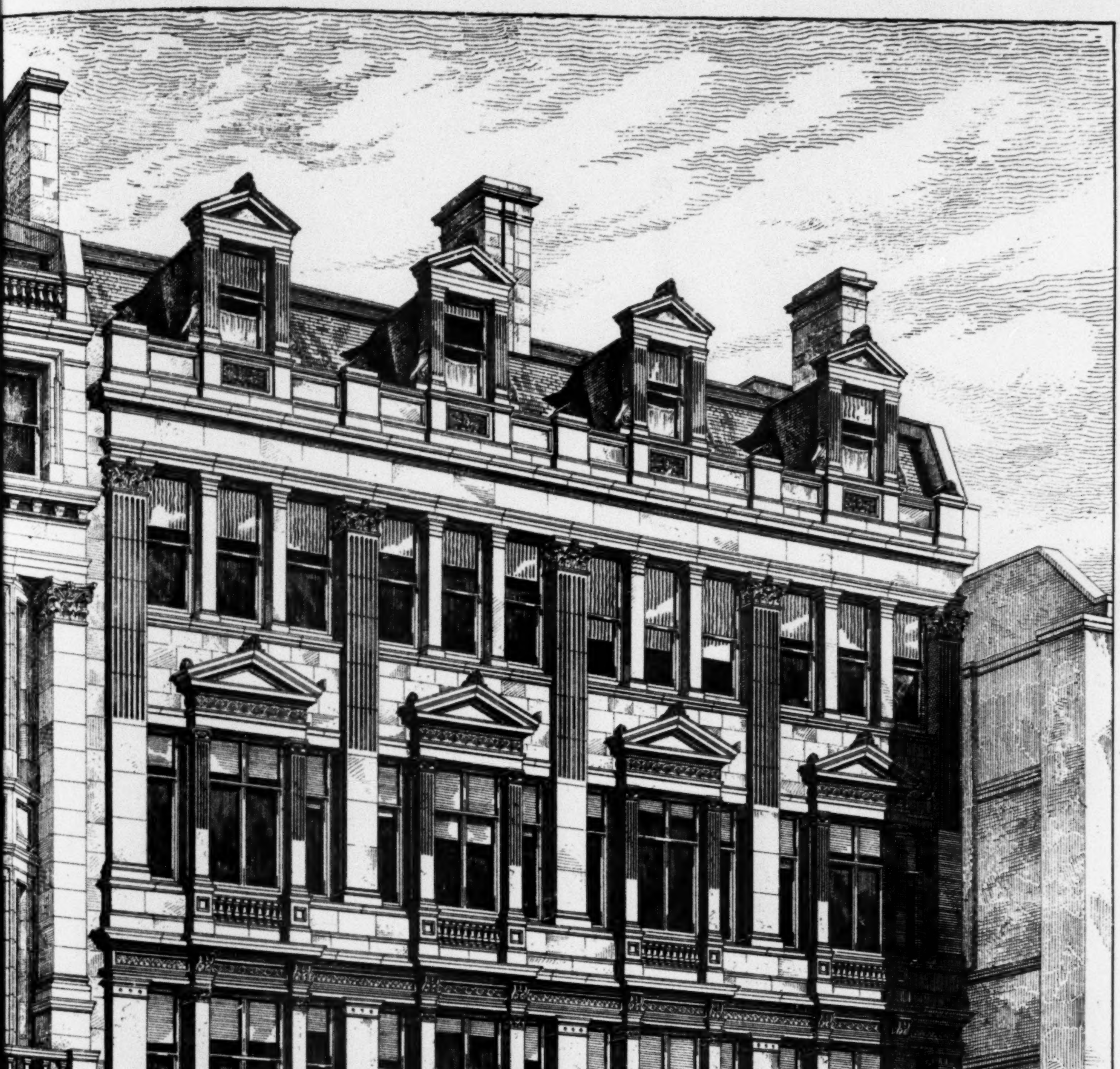
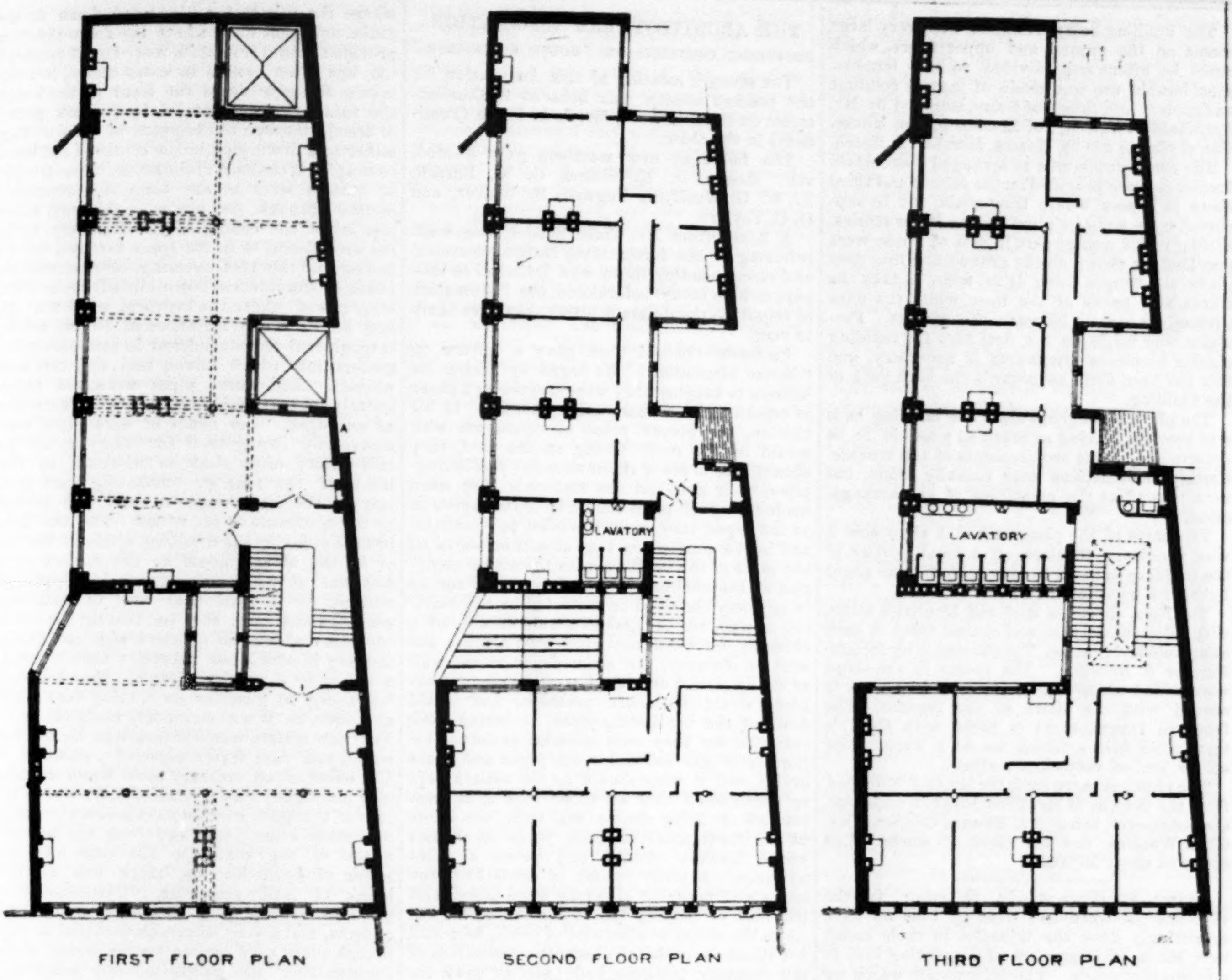

COURT
BROOKS & SONS
166a H·W·LEA & Co 166a
F & G·DEROY
INGRAM
165

PHOTO-LITHO, SPRAGUE & Cº 22, MARTINS LANE, CANNON ST, LONDON, E.C.

INGRAM HOUSE, FENCHURCH STREET.—MR. THOMAS BLASHILL, F.R.I.B.A., ARCHITECT.



FIRST FLOOR PLAN SECOND FLOOR PLAN THIRD FLOOR PLAN

Ingram House, Fenchurch-street.

only 8 ft. high, so constructed as to allow a free current of air to pass over them, and these lead to a broad balcony, so arranged that the patients can be wheeled out into it in their beds.

The mortuary and post-mortem room are placed on the ground floor, isolated from the hospital.

The building is constructed of red brickwork, and all dressings are of Portland stone.

Mr. H. L. Holloway obtained the contract in competition with eleven other builders, and is carrying out the work.

THE COLIGNY MONUMENT, PARIS.

The marble statue of the Admiral Gaspard de Coligny, of which we give an illustration this week, is intended to adorn the monument which is soon to be erected at Paris by public subscription. It is the work of M. Crank, one of the most eminent disciples of Pradier, and the author, among other works, of the winged Victory, which stands in the Square des Arts et Métiers.

The monument is to be placed in front of the apse of the "Temple d'Oratoire" of the Louvre, and will therefore face the Rue de Rivoli, from which it will be separated by a small garden surrounded by an ornamental grille. It has a large pedestal in the form of a cenotaph, surmounted by two allegorical figures in marble seated on the extrados of a pediment. That on the right, symbolising "La Patrie," is grouped with a crown, bearing an inscription commemorative of the siege of St. Quentin, where the gallant warrior distinguished himself. The figure on the left represents Religion. Near it is engraved the ill-omened date of St. Bartholomew. Between these two figures an open Bible, sculptured in bas-relief on the base of the statue, recalls the source whence Coligny drew his patriotic valour and Christian faith.

The whole sculptural group is relieved against an architectural composition consisting of an order of Corinthian columns supporting an entablature, above which will be engraved the arms of the Coligny family.

The three figures carved by M. Crank, and which are still detained in the Depôt des Marbres de l'État,* are each 3 mètres in height. The whole monument will be about 10 mètres high by 7 wide.

We may add that the Committee, which includes all the leading persons of the "monde reformé" of Paris, and is presided over by the Marquis de Jaucourt, has already raised in France and in the Protestant countries of Europe, and principally in England, a sum sufficient to warrant their commencing the work, as soon as the Municipality of Paris shall have officially approved it.

WEST CROYDON CONGREGATIONAL CHURCH.

This church is situated at the junction of the London and Campbell roads, Croydon. It is designed in the Early Decorated style of Gothic, arranged on plan with narrow aisles, nave with central passage and double transepts, and a small gallery at the west end. The tower, with the spire, rises to the height of about 150 ft. Vestries are provided at the rear for minister and deacons, as also a church-parlour. The organ-chamber is at the south side of the apse, and opens towards it, as well as to the church; it contains an instrument by Messrs. Hill & Sons, which cost about 1,200*l.* At the north side of the apse is the pulpit, which was the gift of the Misses Peacock, of Thornton Heath, and was executed by Mr. Sansom from designs by the architect. Externally the church is faced with Kentish rag, in drop-coursed work, finished with a fine joint. The dressings, mouldings, windows, &c., are in Monks' Park stone, from the quarries of Mr. Sumsion at Bath. The interior walls are lined with Farleigh Down stone, relieved with bands of blue Bath, from the same quarries; the columns supporting the roof trusses are in similar stone, while the clustered columns to the nave arches supporting the clearstory are in brown Portland. The fittings throughout are in pitch pine.

The following gifts have been made to the church:—A stained-glass triplet window at the west end, by Mrs. Peacock, executed by Mr. Frampton; and the clock and chimes, by Mr. J. Spencer Balfour, J.P., the work of Messrs. Gillet & Co.

All the carving was executed by Mr. Sansom; Messrs. Vaughan & Brown did the gasfitting, and Mr. Boulting the warming. The ventilation of the building is by inlets built into walls, and the vitiated air is extracted by one of Boyle's ventilators. The work was carried out by Mr. James Holloway, from the designs and under the superintendence of the architect, Mr. W. D. Church. The foreman was Mr. Jones, and the clerk of works, Mr. Laurence. The cost of the building, exclusive of the pulpit, stained-glass windows, organ, and bells, was about 10,500*l.*

INGRAM HOUSE, FENCHURCH-STREET.

This building occupies the sites of four different premises that were acquired for its erection, except so much of the frontage as was taken for the widening of Fenchurch-street. It consists of three shops of moderate size, each having its basement, and of very extensive suites of offices and store-rooms occupying seven stories, and extending along the whole of the east side of Ingram-court. There is a sub-basement for storage, and a half-basement above it, lighted from Ingram-court. The principal entrance has a lobby panelled in teak, leading to the entrance passage and the staircase, which gives access to the offices. The floors of these parts are laid with mosaic pavement in ornamental patterns, by Messrs. Diespeker. The walls throughout the passage and staircase are covered with scagliola, by Messrs. Bellman & Ivey, the dado being of a very rich red, the capping of dark green, and the wall surface of yellow. The staircase is of Cliffwood stone. The windows of the staircase are of Venetian glass, by Messrs. Powell, of Whitefriars.

---

* Strangers passing through Paris who wish to see the statues of the Coligny monument should ask permission from M. le Pasteur Bersier, Boulevard Pereire, 216.

The building being designed with very large rooms on the ground and upper floors, which could be afterwards divided to suit tenants, considerable use was made of iron in columns and girders and fireproof floors, supplied by Mr. Archibald D. Dawnay, of London Bridge House. The skylights are by Messrs. Marshall & Hatch.

The construction was so arranged that certain fireplaces were provided on the second and third floors in places where they could not be supported upon walls or piers on the lower stories. Strong rolled iron girders in sets of three were provided, as shown on the ground and first floor plans, the flanges being 4½ in. wide, to take the fronts and backs of the flues, while the flues themselves ran up between the girders. Provision was made on the first floor for building similar fireplaces afterwards if necessary, and this has been done as regards the back part of the building.

The plans throughout show the building as it was erected, leaving as much as possible to be determined by the requirements of the tenants. Certain modifications were actually made, but none that affect the principles of the arrangement.

The parts of the plan marked **A** show how it was necessary to slope off a small portion of the building in order to prevent a dispute about light with an adjoining owner.

The front elevation is of red Dumfries stone, with pilasters on first and second floors in dark Shap polished granite. The carving is by Messrs. Farmer & Brindley. The fronts to the shops were added when the shops were let, so as to accord with the views of the tenants. The front in Ingram-court is faced with Candy's terra-cotta bricks, which are of a warm white colour, and of very close texture.

The premises were built for Mr. C. J. Knowles, from the designs of Mr. Thos. Blashill, architect, the contractor being Mr. Edward Conder. Mr. Chas. Watkins was the clerk of works. The cost was about 16,000*l.*

Houses at Chicago.—In referring to the sketches published last week (p. 148) we have unwittingly done the injustice to their architect, Mr. S. G. Beaumont, of consigning him to a premature grave. The information which we understood to refer to the architect of the houses, viz., that he was educated in a London office and died shortly after going out to Chicago, referred, Mr. Townsend tells us, to the draughtsman, Mr. G. W. Tait, who made the sketches, and whose signature is appended to them.

BRITISH ARCHÆOLOGICAL ASSOCIATION.

AT the meeting on Wednesday, the 19th, Mr. W. De Gray Birch, F.S.A., in the chair, reference was made to the death of Lord Iddesleigh, one of the vice-presidents of the Association. The Rev. Scott Surtees exhibited a large collection of fragments of Roman pottery and brick found at Pounteys Bridge, Dinsdale, on the River Tees. Mr. Loftus Brock, F.S.A., exhibited Roman pottery of various kinds found at Vinovia (Binchester) during the recent excavations there. Mr. Roofe exhibited a fine ancient Mexican bowl, similar in style to some others shown on a previous occasion. Mr. Irvine forwarded sketches of Roman graves, formed of tiles of large size, made for this use, of peculiar pattern, one tile being sufficient to form the end of each compartment. Each tile bears a legionary stamp. A paper was then read on the "Early Sculptured Crosses and Stones of the Isle of Man," by Mr. Romilly Allen, F.S.A. (Scot.). These crosses are worked in the local slate of the island, and are found in considerable numbers, the earliest being a pillar stone at Santon, having an inscription in Roman capitals, AVITI MONUMENTI; but the inscriptions are almost entirely Scandinavian, with runes. The forms are not unlike those of the early crosses of Scotland, Ireland, and Wales, but the ornamental patterns more frequently cover the whole of the shaft, without being divided into panels. The symbolism of the figures was dwelt upon, and it was stated that only a single representation of the Crucifixion has yet been found. The story of Sigurd and Tafna is shown on one of the crosses. The paper was illustrated by a fine collection of photographs and rubbings of the monuments described. A paper was then read on Roman Chichester, by Mr. C. Roach Smith, F.S.A. The whole of the inscriptions found in the city were described.

THE ARCHITECTURAL ASSOCIATION.

PROFESSOR CORFIELD ON "HOUSE SANITATION."

THE seventh meeting of this Association for the present session was held at 9, Conduit-street on the 21st inst., Mr. J. A. Gotch (President) in the chair.

The following new members were elected, viz., Messrs. J. K. Wilson, G. W. Burrell, T. W. G. Woolf, S. Tugwell, S. Walker, and G. C. Taylor.

A letter from Mr. Thos. Blashill was read, referring to the forthcoming Italian excursion, and recommending those who intended to take part in it to study beforehand the information in regard to the different places they were likely to visit.

Professor Corfield then gave a lecture on "House Sanitation." He began by asking his hearers to suppose they were inspecting a house in regard to its sanitary arrangements. In his opinion, the proper place to commence with would be the roof. Going on the roof, they should look to see if there were any ventilating-pipes, their size, and the materials they were made of. Such pipes should be of the same size as the pipes they were intended to ventilate, and in the next place they should be above all the parts of the building, with the single exception of the chimneys. But they should not be in any way sheltered or protected by any building or wall, nor be against a wall or side of a chimney, for when the wind blew against the wall or chimney, the air in front of the wall or chimney, and over the top of the ventilating-pipe, would be under pressure, and would descend the ventilating-pipes, reversing their currents, for they were intended as outlets for the air of the soil and waste pipes and house drains, and if what should be the outlets were so constructed that air could blow in at them instead of being drawn out, then the inlets in the front areas or back yards of houses would become outlets, and prove a great nuisance. A great variety of cowls had been made and used for crowning these pipes, with the idea of helping the extraction of the air. As to the utility or otherwise of cowls, he would not speak too positively, because a committee of the Sanitary Institute had been at work for some time on the question, had made an exhaustive report, and would shortly give the world the results of a series of experiments. He did not know what those experiments would prove, but he believed he might safely say that it was unnecessary, in almost any position, that there should be a cowl at the top of any soil-pipe. The only thing requisite was to have a few wires across the top of the pipe, and some holes or slits a little way down the side. The wires would prevent anything getting into the pipes, such as birds, which were fond of building their nests where there was a bend a little way down. The holes or slits would be of great use in allowing the air to blow through on the occurrence of heavy snowstorms, especially when the snow froze together as it fell, blocking the tops of the pipes. On the roof, too, they must look for the way in which the rain-water was got rid of. That was best done by pipes, front and back, carried down outside the house, and made to discharge in the area or yard below, either above a gully grating, or below the grating into a ventilated space above a trap. Rain-water pipes were, however, frequently carried down inside the house. It was not an uncommon thing to find builders, and even architects, who would not allow the pipes to go down the front of the house, so that the rain-water pipes were either embedded or encased in the walls, or carried down inside, often passing through the bed and sitting rooms into a drain in the basement. The pipes so improperly placed were frequently faulty in their jointing, and were, besides, liable to rapid decay, and especially when they were imperfectly trapped at the foot, they were mere channels for the admission of foul air into the dwelling. If trapped at the foot, and then connected with the drain, it made little difference, because, even with water in the trap, they were apt to become very foul. In the intervals of storm or rainfall, the foul air from the drain passed, in accordance with the law of diffusion of gases, through the water in the trap, filling the rain-water pipe with foul air, and nearly as foul as if no trap existed at all. He had frequently known cases of illness to persons sleeping in bedrooms the windows of which looked out behind parapets immediately over the rain-water gutters, often at the very point where the rain-water pipe went down to the drain, and that even where the down-pipe was provided with a trap at its foot. Great mischief, too, was often caused in cases where, to avoid taking the pipe down the front of the house, the rain-water was carried in an open gutter or trough through the top part of the dwelling, either to a down-pipe in the centre of the house or to a pipe at the back of the house. These troughs or gutters were at one time very commonly carried through the house in this way, either just below the ceiling of the top story, under the attic floors, or in the space between the top ceiling and the roof covering. Sometimes the heads of the internal down-pipes for rain-water were placed under the bedroom windows. He had known many instances of illness arising through foul air engendered in such rain-water gutters, into which leaves, soot, and dirt were washed. Rain-water pipes were not unfrequently, but very mistakenly, made to serve also as soil-pipes. The heads of such pipes were necessarily (being used for carrying off the rain-water) often close to windows, so that much of the foul air emanating from them entered the open windows, and was inhaled by the occupants of the rooms. The first thing to look at inside the dwelling, either in the roof or in the attics, would be the cistern. The material of which it was made should be noticed, for a good deal both of truth and nonsense had been said on this subject. The common material for a cistern was lead, not in the way in which our ancestors used it, but as a lining to a wooden cistern. Now lead was not nearly so mischievous a thing for cisterns and pipes as it was commonly made out to be. Very few waters would attack lead, though soft water, and rain water especially, would do so. The effect of an ordinary town water on lead was practically inappreciable, and even in the case of Glasgow, where a most necessary change was made some years ago from the polluted water of the Clyde to the pure and soft water of Loch Katrine, there was no outbreak of lead-poisoning. Galvanised iron was now fast replacing lead as a material for cisterns, and a very admirable material it was, though there were certain waters which would dissolve zinc (and galvanised iron was simply iron dipped in zinc), the salts of which were poisonous. It was important to observe whether the cistern was clean, and capable of being easily kept in that condition. There was no pipe in the house of so much importance to the health of a house as the waste or overflow pipe of the drinking-water cistern. That pipe used invariably to be connected directly with the drains, and in that case the foul air, containing possibly the poison of one or more specific diseases, would get into the cistern. Even should the foul air not contain such poison, it would contain foul, putrescent, organic matter, suspended or else in a gaseous state, which the drinking-water would readily absorb. He had seen, in many old houses, the "standing wastes," as they were termed, of drinking-water cisterns connected directly with the drains, soil-pipes, and traps of water-closets. He was afraid that in many old houses that highly pernicious arrangement still existed unsuspected. Such waste or overflow pipes ought, of course, to be entirely dissevered from all connexion with drains, soil, or waste pipes. There were several ways of disconnecting them, but they should never be carried directly over a foul gully. A very common but very inefficient device was to put a siphon trap on the waste-pipe, or make a bend on it before it entered the drain, but such a trap did not always remain full of water, and even if it did it would not prevent the admission of foul air to the cistern by absorption and diffusion, in the way previously mentioned. The lecturer proceeded to give several examples of the extraordinary attempts on the part of plumbers who did not understand the true principles of sanitary science to remedy these defects. Dealing next with the housemaid's sink, the lecturer stated that its position should be against an external wall, with a window capable of affording ample ventilation. The commonest form was the wood sink, lined with lead, but the best material was white glazed stoneware, which could be kept perfectly clean and sweet, whereas oily matter adhered to lead, and rendered it difficult to keep clean. The waste-pipe of the sink was frequently wrongly connected with some part of the soil-pipe. In order to prevent the ingress of foul air a P-trap, or what was incorrectly termed a siphon-trap (for if it would siphon out it would not be a trap) should be used. The waste-pipes from such sinks should always end in the open air over the trap of a gully, or into the side of the inlet of one, or over an open pipe head. The waste-pipe of an up-stairs sink should either be carried through the external wall and discharged into an open pipe head or taken down and disconnected at the foot, being at the same time carried up through the roof full bore for ventilation. The bell-trap was often used for such sinks, the waste-pipe being connected with the soil-pipe. A more improper or highly dangerous arrangement could not be conceived, for when the bell was taken off there was no trap, and the pipe would, of course, ventilate itself into the house. Where a series of waste-pipes or closets discharged into the same down-pipe there was great danger of some of the traps becoming siphoned out and unsealed unless the main pipes and the branch pipes as well were efficiently ventilated. This was shown by a series of demonstrations made in face of the audience by the lecturer. Every pipe down which foul water went should be as small as possible, so that it might be self-cleansing. The waste-pipe of a bath should be trapped and disconnected in very much the same manner as the waste-pipe of a sink. The waste-pipes of sinks, although disconnected from drains or discharging over open gullies, should also be trapped immediately under the sink. If not they would become, and especially at night, inlets for outside air, which would be more or less tainted by the impurities which would necessarily adhere to the inside of the pipe. The up-stairs water-closet should be against an external wall, with a window opening into the air. Water-closets are often placed in improper positions, such as in the very centre of the house or under the stairs, and very often no attempt was made to ventilate them or they were very imperfectly ventilated into a shaft going up through the dwelling, into which rooms were also ventilated. Such things as this should be done away with, and the closets put against the outside walls. The soil-pipe into which the water-closet discharged should be outside the house, for, however perfect such pipes were at first, they did not remain so for ever. The best material was strong lead pipe with properly soldered joints, which could be made stronger than the pipe itself, thus giving much less chance of leakage than iron pipes having what might be called mixed joints. The soil-pipe carried down outside the house should be taken into a 6-in. drain, passing into a trap with an air inlet above the water-line. The soil-pipe might be connected with the drain at its foot, with the view of being the outlet ventilator, and be disconnected from it by a disconnecting trap, in which case the drain would have to be separately ventilated by an outlet-pipe carried up above the roof. If soil-pipes were not ventilated they would ventilate themselves sooner or later, for the sulphuretted hydrogen and other gases arising from sewage would act upon the lead in such a way as to eat holes into it and thus make their escape. The lecturer here exhibited a piece of piping showing hundreds of little holes eaten into the lead in this way. The soil-pipes inside houses were often placed in almost inconceivable positions, sometimes horizontally under floors, or placed in walls, covered over and plastered, so that nobody knew where they were until some one was taken ill, and on examination a soil-pipe, riddled with holes, was found, perhaps, in the wall immediately behind the bed-head. In all upstairs water-closets the trap should be part of the soil-pipe, and not part of the closet apparatus itself, as it was in so many earthenware closets. The reason why he condemned such closets was that if, for instance, there was an earthenware basin with an earthenware trap all in one piece, the weak point would be the joint between the trap and the soil-pipe, which would be a joint between two different materials, and necessarily more or less weak. Therefore, for up-stairs closets, discharging into lead soil-pipes, there should be lead traps soldered. In that case, if the apparatus got shifted in the least, the joint that would go would be the one between the apparatus and the trap, or, in other words, the one above the trap, and not the one between the trap and the soil-pipe, as would be the case in the event of a settlement of one of the combined earthenware closets and traps to which he had referred. To protect the ceilings below the floor in case of overflow of the basin or leakage of a valve, it was usual to put a lead tray, called a "safe," —a word the most inapplicable of any in the language to the contrivance as commonly constructed. The waste-pipe of the safe-tray should be carried direct through the external walls, and made to discharge into the open air; it should be provided with a little brass flapper to prevent draughts. The apparatus most commonly used in old houses was the pan-closet, which could not be too strongly condemned. It was a curious thing, and one not generally known, that long prior to its introduction the valve-closet had been invented and brought to a considerable degree of perfection by Alexander Cummings in 1776, the main difference between his closet and that now in use being that in his the valve was really a slide to let the water out. That closet was patented in 1776, an improvement being made upon it by the well-known Bramah, who made it more workable, though he did not improve it in principle. Practically in the form in which Bramah had left it it had been used ever since. The valve-closet had great advantages, one of which was that it held a large quantity of water in the basin, but as originally devised it had certain disadvantages that had not yet been quite got over. The first of these was that it was supplied with water only at one part of the basin. Valve-closets were now made with flushing rims, which, however, necessitated a large supply of water, and larger pipes. The next thing was the overflow-pipe from the basin, which might get siphoned out in the following manner. Below the valve was the valve-box, and below that the trap. When a large volume of water was discharged from the basin, it went into the valve-box, and through the trap. That partly exhausted the air in the valve-box, so that when the valve was shut, the water drained out, leaving the valve-box in a state of partial vacuum, and thus the overflow-pipe became untrapped. The difficulty was got over in several ways, one of which was to ventilate the valve-box by a pipe carried through the external wall. Again, if the overflow were opposite the handle and passed into the valve-box opposite the valve, when the handle was pulled up some of the contents of the basin were shot into the outlet of the overflow-pipe. The result was that the overflow-pipe and the little trap at the bottom got very foul, so that the proper side for the overflow-pipe valve was the left-hand side, because when the valve was opened it closed against the overflow-pipe and prevented anything getting into it. The valve-closet was for long displaced by the pan-closet on account of the cheapness of the latter, and possibly because of its being well advertised at the commencement. The first disadvantage of the pan-closet was the conical shape of the basin, and it had a large iron receptacle beneath it called the "container," which got very foul, for it was a veritable "container" of filth; so that every time the handle was pulled the foul air was forced up into the house. That evil was only very partially cured by having a ventilating-pipe, carried up outside from the "container." The evils of the pan-closet were intensified when such an apparatus was fixed over an old-fashioned D-trap, which was in reality a miniature cesspool, and could never be thoroughly flushed out. The water-closet on the ground-floor was often necessarily placed in such a position that it required a separate soil-pipe, which was more often than not left unventilated. All water-closets should invariably be supplied from cisterns which did not supply taps. It was of no use to say that drinking water or water for culinary purposes was only to be drawn from one particular tap. Practically every tap must necessarily be looked upon as a tap for supplying drinking-water, for servants and others would replenish water bottles and jugs at the nearest tap, any injunctions to the contrary notwithstanding. Therefore, draw-off taps should under no circumstances be supplied from the cistern that directly served the water-closet. The best thing was to have a separate cistern to supply the water-closet, and the only other way of meeting the difficulty was to have water-waste preventing or intercepting cisterns between the main cisterns and the closets. Closets in basements were commonly hopper or "wash-out" closets. The ordinary long conical hopper was a very bad form of basin, but what was known as the "short hopper" was a great improvement. This was not a regular cone, being more vertical at the back than in the front, and having also a flushing-rim. The traps should be simple bends, either P or S traps, and in the case of basement-closets should be stoneware traps cemented to stoneware drains. A disadvantage of hopper closets was that they held no water in the basin, only in the trap. That had been partly got over without employing complicated apparatus by the invention of the "wash-out closet," which retained a small quantity of water in the basin, and in which the outlet was at the side or in front of the basin, there being a weir over which the water and the other contents of the basin had to go to make their way into and through the trap. Various forms of this type of closet had become favourites, and especially the pedestal closets. The disadvantage of the wash-out closets which he had seen was that the weir, before referred to, was apt to become fouled, and no amount of flushing would keep it clean. Unless the handle of such a closet was well pulled the basin got extremely foul, so that on the whole the small short hopper was a superior apparatus to the various forms of "wash-out" closets.* The "plug" closet had an outlet at the side, closed by a solid plunger, but this form had the disadvantage that one could not see the outlet, which was apt to get clogged with paper and other adherent matter. In connexion with scullery sinks, fat-traps were, as a rule, quite unnecessary, and all that need be said about them was that the waste-pipe should be disconnected from them. In inspecting the basement of a house, bell-traps would frequently be found in the floor. These were exceedingly mischievous and dangerous. There should be no traps in the basement of a dwelling connecting with the drains; and if there must be gullies there, they should be made to discharge outside the house, and entirely disconnected from the drain. As to the drains themselves, it should be seen whether the soil-pipes were ventilated, and so on; and if there were inspection chambers, it was an easy matter to examine them. Brick drains under houses were highly improper drains; they would not hold water, and rats made their way through them into the dwellings. Wherever rats went, the foul air followed, and thus the existence of rats in a house was always a very suspicious circumstance. The best way to test the water tightness of a drain was to block it at the lower end, filling it with water to the upper end, marking the level, and allowing the water to stand for half an hour or longer. If the water did not remain at the same height the drain was not, of course, water-tight. A good test of the efficiency of traps, &c., was by blowing in smoke, which, if it escaped in various parts of the house, showed that the traps were not efficient. A third plan was to discharge a specially-made rocket into the drain, thus causing an immense amount of smoke from any leaks that might exist. Drains should be water-tight and smoke-tight, but the better test was to be water-tight. In the case of new drains, they should be tested after being filled in as well as before. Cast-iron pipes coated with Angus Smith's solution were now largely used for drains. These iron drains had the advantage over those of stoneware of only having a joint every 6 ft. Stoneware drains, however, were made of a material which was absolutely unalterable, which water and acids would not touch, and they were smooth inside. No doubt an iron pipe could be made gas and water tight now, but what authority was there to show that it would be so in ten years' time? He answered, "none"; iron was a perishable material, rusted by moist air, and affected by acids. Even when said to be coated with a preservative solution, could they be sure of its being protected everywhere? Only the other day he saw a Barffed iron pipe eaten through and through merely by drinking-water. It was, therefore, a wrong principle to use a material known to be perishable, instead of a material like stoneware, which was practically unalterable. The method most in favour for jointing iron pipes was to caulk the joint and pour in lead or some fusible metal. There was not a street in which the gas and water pipes did not leak, and though an iron drain might be made perfectly tight at the beginning, he defied any pipe with a metal joint to last without leaking, because two metals used in conjunction and in contact with moisture and acids must of necessity set up a galvanic action, so that iron drain-pipes might be said to contain within themselves the elements of their own destruction. Iron drains had the additional disadvantages that they were not smooth inside, and that they were liable to expansion and contraction when hot and cold water were thrown into them alternately, thus making it inevitable that their joints must become loosened. Because iron pipes were used as gas-pipes, as water-pipes, or even as sewers, no one had any right to infer that they would answer for house-drains, into which boiling water might be poured at one minute and cold water the next. But whether the drains were of iron or stone-ware, they should be disconnected from the cesspool or main sewer. If drains had not a sufficient fall, such as 3 in. in 10 ft., they would not keep themselves clear of deposits unless some artificial means were used, such as a flush-tank, discharging at intervals. This tank should not be too large, otherwise the rush of water would cause every trap in its course to become unsealed. Prof. Corfield, after a few further observations, resumed his seat, having spoken for about two hours. He was attentively listened to by a very large audience. The various points touched upon were clearly illustrated by a series of large diagrams lent by Mr. Rogers Field and Mr. Hellyer, and by specimens from the Parkes Museum.

---

* We cannot agree with Professor Corfield here. No doubt some forms of wash-out closet require a large flush of water to ensure clearing everyteing over the weir, and some of the waste-preventing cisterns now made are too small for safety in regard to any closet of this type. But the type of pedestal closet in which the water is driven forward across the basin to the weir through a series of pierced openings, so as to come with considerable force, appears to us as perfect a sanitary closet as can be made. Other types of "wash-out" basins we have found work very well with a large flush, and all forms of closet ought to be liberally supplied with water, if only to ensure proper carriage to the drain.—ED.

The Chairman, at the close of the lecture, said that as the next meeting was an open night, it had been suggested that the discussion should be adjourned until that evening. The only drawback to that arrangement was that Prof. Corfield was afraid he might be unable to be present.

On being put to the meeting the Chairman's suggestion was unanimously agreed to.

Mr. John Slater, B.A., next proposed a hearty vote of thanks to the lecturer, who, he hoped, would be able to be present at the adjourned discussion.

Mr. Thomas Blashill seconded the proposition, and thanked Prof. Corfield for having given so complete a treatise on the subject.

The vote of thanks was then put, and carried by acclamation, and the proceedings terminated.

ROYAL INSTITUTE OF BRITISH ARCHITECTS.

SUBJECTS FOR MEDALS AND OTHER PRIZES, 1888.

The following recommendations of the Council, in the matter of the subjects for medals and other prizes, to be next competed for, were submitted, considered, and adopted at the meeting of the Institute on the 17th inst., viz. :—

The Tite Prize, &c.—Design for a district post-office for a site not exceeding 3,000 square feet, including areas. All the public portion is to be on the ground-floor, and the public office is to face principal street, with stairs leading to telegraph-office above; a sorting-room lighted by skylight; expedition office for bags of letters and parcels; a postmaster's room with private entrance leading to residence on second floor,—the residence to contain two sitting-rooms, four bedrooms, kitchen, offices, &c.; first floor to contain telegraph instrument-room, room for telegraphic messengers, retiring-room for female assistants; clerks' lavatories, &c.; basement to contain kitchen and waiting-room for letter-carriers and others, lavatories, &c., cellars, &c., all accessible from the street.

The Grissell Gold Medal, &c.—Design for the stone groining of a semi-circular or polygonal apse and adjoining bay of a chancel 24 ft. wide.

The Soane Medallion, &c.—Design for a gentleman's country-house, the principal accommodation to be drawing-room about 750 square feet, dining-room about 600 square feet, morning-room about 400 square feet, library about 500 square feet, billiard-room about 550 square feet, hall and staircase about 800 square feet. A kitchen and all requisite offices, including sculleries, larders, butler's pantry and bedroom, housekeeper's-room and store-rooms, servants' hall, &c.; five bedrooms with dressing-rooms, eight bedrooms, including nurseries; also bedrooms for servants.

The Silver Medal (Measured Drawings).—Among the buildings suggested to competitors, strike out from the authorised list in Kalendar (p. 91):—Gateway of Caius College, Cambridge; and Haddon Hall. Add:—Pluscardine Abbey, near Elgin; Jedburgh Abbey, Melrose Abbey, Chepstow Castle, Christ Church Priory, Hants; Sutton-place, near Guildford; Almshouses at Guildford; Deddington Church, Suffolk.

The Silver Medal (Essays).—History of the Developments of Church Planning from the beginning of the Christian era to the Reformation.

THE SURVEYORS' INSTITUTION.

PRELIMINARY EXAMINATION, 1887.

Of the candidates who presented themselves at the Preliminary Examination of the Institution, held on the 18th and 19th instant, the following satisfied the examiners:—

Allday, A.
Austin, R., jun.
Aylen, C. H.
Beadel, M. F.
Bower, A. W. C.
Chalcraft, H. T.
Charles, A. G.
Child, E. H.
Crawshay, L. R.
Crouch, J. L.
Dawson, H. N.
Dendy, W. C.
Dickins, A. W.
Galsworthy, V. S.
Harris, F. J.
Hudson, E. R.
Joyce, H. W.
Langley, C. S.
Lutener, O. C. H.
Mackenzie, G. A.
Messom, F. W.
Morrish, H. K.
Nockolds, A. G.
Parris, C. J.
Pownall, G. F.
Prebble, E.
Preston, S.
Punchard, F. B.
Robinson, A. J.
Robinson, J. K.
Salt, R. N.
Savill, E.
Sequeira, E. R.
Smith, J.
Sturge, R. T.
*Sturley, A. D.
Thurgood, A. E.
Weatherall, E. J.
West, C. K.

MESSRS. JOHN MOWLEM & CO.

One of the pleasantest *réunions* at which it has ever been our lot to "assist" was that which took place in the Great Hall of the Cannon-street Hotel on Wednesday evening, when the present members of the well-known firm of John Mowlem & Co. (formerly, Mowlem, Burt, & Freeman) entertained the members of their staff (managers, clerks, foremen, and gangers), to dinner in order that those *employés* of the firm (about 150 in number) might formally take leave of the two late senior partners in the firm, Mr. Joseph Freeman and Mr. Ex-Sheriff George Burt, those gentlemen having been associated together in the firm for more than fifty years. It may be mentioned here that these gentlemen retired from the firm on January 1. At the same time Mr. George Burt, junr., who had been associated with the outside direction of the firm's operations for some years, was admitted into partnership. The business will still be carried on under the style of John Mowlem & Co., the members of the firm now being Mr. John Mowlem Burt, Mr. William Robert Freeman, and Mr. George Burt, junr. It should also be mentioned that the guests of Wednesday evening included members of the staff who had been forty-four years, thirty-five years, thirty-one years (two), thirty years, twenty-eight years (three), twenty-seven years, twenty-four years, twenty-two years, twenty-one years (two), twenty years (three) in the service of the firm. Twenty-one had been with the firm for periods ranging from ten to twenty years, forty-three for from five to ten years, and nineteen for from two to four years. These figures would afford some corroboration, if such were needed, of the mutual good-feeling which has long subsisted between the heads of the firm and its *employés*, and which we trust (and doubt not) will continue to subsist.

Before sitting down to dinner, the guests assembled in one of the reception-rooms to witness the presenation of the following address, which was made on behalf of the signatories (and on behalf of many others who would have been signatories had the space on the vellum afforded room for the inscription of their names) by Mr. E. Hall, chief of the out-door staff, whose appropriate and evidently heartfelt remarks were warmly applauded by the guests,—

> "*To Mr. Joseph Freeman and Mr. George Burt.*
>
> We, the undersigned, members of the staff of John Mowlem & Co., in presenting you with this address on the occasion of your retirement from the firm after having been at its head for nearly half a century, desire to record our grateful recognition of the kind feeling and uniform consideration you have exhibited towards us during the time it has been our privilege to serve you, and also to express our sincere wish and earnest hope that you may for many years to come be blessed with health and strength to enjoy the leisure and repose which you have so well and ably earned.
>
> 26th January, 1887."
>
> [Here follow ninety-nine signatures of those who have been in the service of the firm more than two years.]

Mr. Freeman and Mr. Burt made brief but appreciative acknowledgment of their thanks for the presentation.

At the dinner which followed, the chair was taken by the present senior partner of the firm, Mr. John Mowlem Burt, who had the retiring partners right and left of him. Two of the vice-chairs were occupied by Mr. William Robert Freeman and Mr. George Burt, jun., the other existing partners, and the third vice-chair by Mr. J. Marsden, chief of the indoor staff. We should be glad did our space and the time at our disposal before going to press permit of our reporting some of the speeches, but we must content ourselves with an enumeration of some of them, and with remarking that the proceedings throughout were marked by the same spirit of mutual regard between employers and employed that found expression in the address and in the replies made thereto. While the existing partners of the firm were very heartily received, the retiring partners seemed to be regarded by all their guests as the Brothers Cheeryble of the building trade. After the loyal and patriotic toasts were disposed of, Mr. T. W. Ratcliff proposed "The Retiring Partners," both of whom responded. The Chairman next gave "The Staff," coupled with the names of Mr. J. Marsden (in-door), Mr. E. Hall (out-door), and Mr. G. C. Harrison (estimating and measuring office), who severally responded. Mr. Ex-Sheriff Burt next proposed the toast of the evening, "John Mowlem & Co." coupled with the names of all three partners, who responded, and after one or two other toasts the company separated.

ARCHITECTURAL SOCIETIES.

Glasgow Architectural Association. — The fourth of a series of lectures was given on Tuesday evening last, when a paper on Floors, by Mr. John Honeyman, F.R.I.B.A., was read in his absence by the President, Mr. Wm. H. McNab. The subject was considered under two divisions,—ground floors and upper floors. The first comprised brick vaultings, stone and tiled, flooring and wood-block flooring, with the precautions necessary to prevent dry-rot, &c.; and the second, common wood joisting, joisting in conjunction with metal beams of various types, and several systems of fireproof construction. These were all in turn described, and attention drawn to the points which had appeared of most interest in the writer's experience, his intention being to give not so much a treatise on floors, for that can be had in the text-books, as an account of actual floors, dealt with in the course of his own practice. A hearty vote of thanks was passed to Mr. Honeyman for his interesting and instructive paper.

Manchester Society of Architects.—In the students' competition the following awards have recently been made by the Council. In the sketching competition, the Society's prize of five guineas, is awarded to Mr. James B. Broadbent; and Mr. G. T. Redmayne's prize of three guineas to Mr. Herbert Ogden; Mr. James P. Holden's prize of three guineas has been awarded to Mr. R. G. Beard, for measured drawings of the Manchester General Cemetery Buildings.

Obituary.—The German papers announce the death of Herr Friedrich Amerling, the celebrated Austrian artist, which occurred a few days back at Vienna. Herr Amerling, who was formerly a pupil of the English painter, Lawrence, and of Horace Vernet, is best known as the painter of a number of fine historical portraits of no little value and importance.

New City Hospital, Liverpool.—Messrs. John W. Simpson & E. J. Milner Allen, of New Inn, London, who were awarded the first premium in open competition for the new City Hospital at Liverpool, have now received instructions from the Corporation to proceed at once with the drawings and push forward the work to completion as rapidly as possible. The building will provide accommodation for about seventy infectious cases.

---

* Passed at head of list.

CASE UNDER THE METROPOLIS MANAGEMENT AND BUILDING ACTS AMENDMENT ACT, 1878.

WIDTH OF STREET.

AT the Greenwich Police-court, before Mr. Marsham, Thomas Gill, of 21, Osborne-street, Whitechapel, builder, was summoned by the Metropolitan Board of Works, for that he did unlawfully, at the corner of Ivy-lane and Ladywell-road, in the parish of Lewisham, make default in setting back the external fence of a certain house or building to a distance of 20 ft. from the centre of the said road, contrary to 41 and 42 Vict., cap. 32, sec. 6. Mr. Thos. Burton, solicitor, appeared for the Board, and Mr. Moss for the defendant. Mr. Burton stated that the defendant was a builder, and had erected the above house in Ivy-lane, opposite the gates of the Lewisham Cemetery, without having widened Ivy-lane to a width of 20 ft. When his plans were sent in to the Lewisham Board, the defendant's attention was called to the same, and he was told to set back the old hedge 20 ft. from the centre. This, however, he declined to do, stating that the boundary of the piece of land leased to him did not extend so far as such hedge; and since the erection of the house he had fenced in the whole of such piece of land on the site of the old hedge.

Mr. John Carline, Surveyor to the Lewisham District Board, was then called in support of the above facts, and produced a plan of the road, showing that by the erection of the fence the defendant had reduced the width of the way 11 ft.

Mr. Badger, District Surveyor, also gave evidence that he saw the defendant on the 25th of August last, when he admitted he was the owner of the fence.

Mr. Moss denied that the defendant was the owner, and stated that the fence was not a building which could be dealt with under the Act, and called Mr. Grundy, who stated that the defendant parted with the property in November last, and that he had now no power to set the fence back.

Mr. Marsham said he should make an order against the defendant to remove the fence within twenty-one days, together with 2*l*. 2s. costs.

SANITARY INSTITUTE OF GREAT BRITAIN EXAMINATIONS.

SIR,—I was greatly surprised when I read the letter, in your issue of the 22nd inst. [p. 164], of Mr. Robert S. Scott, C.E., as to the inutility of these examinations. To express such opinions in your influential and widely-circulated paper seems to me most injudicious, because the fact of their being erroneous does not prevent many young men being misled by them. Although not now acting as a sanitary engineer, I have had more than twenty years' experience in that capacity, and I know that many young men who have been articled pupils in engineers' offices, and therefore supposed to have received a professional training, have failed to pass these examinations. If Mr. Scott wishes to be convinced upon this point, let him attend the next examination and he will then see whether, as he says, they "would have little difficulty in satisfactorily answering the few comparatively simple questions prescribed by the Sanitary Institute." If candidates are not prepared to prove their competency, they had better save their money and reputation by standing on their dignity in the way suggested by Mr. Scott, that men who have been regularly articled in the office of civil engineers could not be expected to "submit to the anomaly of being technically examined by an amateur society." But considering that the chairman is Captain Douglas Galton, R.E., C.B., D.C.L., F.R.S., and amongst the examiners there are four well-known members of the Institution of Civil Engineers, two Fellows of the Royal Institute of British Architects, and the rest all eminent men interested in sanitary science, I think it would not be wise for a professional man to air his dignity too much in the presence of such "amateurs." But there is a more serious aspect to this subject, and that is the fee of 5*l*. 5s. which has to be paid for the examination whether the candidate obtains a certificate or not, and it would be a great reflection upon the committee, and a cruel injustice to the candidates, to impose such a fee if the whole ceremony were a mere farce. I am quite sure the Board of Examiners are influenced by the very best motives, both as regards the welfare of the public and of the profession, by imposing some test of the skill possessed by those who are to be entrusted with the practical application of sanitary science, and that these tests are beneficial both to the public and the profession by weeding from its ranks ignorant and incompetent men. It is about the only profession which has no protection, for any man may dub himself "C.E." without having served an apprenticeship or submitted to any examination. Therefore, this registration of competent men by a high-class authority is undoubtedly a move in the right direction. It is altogether misleading to say that Local Authorities and others attach no importance to these certificates, for it often happens that medical men who had taken degrees in sanitary science are consulted about defective drainage, and this certainly would not be the case if a sanitary engineer, in addition to his practical skill, possessed a special diploma for theoretical science the same as the medical sanitarian. I believe the time is not far distant when Local Authorities will look upon these certificates as an indispensable qualification in their sanitary officials, and I would urge all young men to try and obtain them. The task may not be quite so easy as Mr. Scott suggests, but still it is fairly within the reach of all who have properly studied their profession, and places a wholesome restriction upon those who have not. If these views are correct, then I think all who desire the advancement of sanitary science, and those whose duty it is to administer it, should give every encouragement to the work that has been undertaken by the Sanitary Institute of Great Britain. W. H. COLBRAN.

Burnley.

SCULPTURE, HARRIS FREE LIBRARY.

SIR,—In reference to the illustrations of the Harris Free Library pediment, in your issue of January 15th, I should like to state that under the sketch model the words "Invenit et Direxit," should be added to Mr. Hibbert's name, and that of "Sculpsit" to mine. This explains our respective shares in the work.

I beg you will find room to publish this, in case the words "entirely designed" should mislead.

E. ROSCOE MULLINS.

Books.

Light and Air. By BANISTER FLETCHER, M.P. Second edition. London: B. T. Batsford.

THE full title of this book would alone occupy more space than we can afford for a notice of it. It comprises 124 pages, of which two-thirds are devoted to judgments in celebrated cases and similar matter, and the remaining third to commentary, deduction, and advice. The historical side of the question, which the reader is entreated not to skip, is condensed into five pages, and the remainder are divided between an exposition of the law affecting the subject, and instruction in the legal and other processes necessary to preserve rights and resist trespass. It would be unfair to the author to summarise here the result of his experience as an expert in light and air cases, and we must refer our readers to his book, which is clearly written and illustrated by seventeen sheets of appropriate coloured diagrams. The cases cited are brought down to the latest date, and the whole may be read with advantage by those for whom the book is specially intended.

Every one has heard of the index in which "Mr. Justice So-and-So, his great mind," appears. The old joke is repeated in the only entry under the letter Z, in Mr. Banister Fletcher's index. "Zeal of two Vice-Chancellors in 1865-6, p. 92."

It should be said that the strictly legal portion of the work has been revised by Mr. Edward Utterman Bullen, of the Western Circuit.

Land and Marine Surveying, with Description and Use of Surveying Instruments. By W. DAVIS HASKOLL, C.E. Second edition revised, with additions. London: Crosby Lockwood & Co.

ALTHOUGH this book has reached a second edition, and has been revised since the author's death by a friendly hand, there are blemishes which very much impair its usefulness to those students for whom it has been especially written. A glossary is much needed. The meaning of the word "offset" is first given at p. 18; but the operation is referred to at p. 10, and is there misprinted "effects." The interpretation is very obvions to a reader who is also a surveyor, but to the uninitiated must be very perplexing.

The chapter on boundaries might have been usefully extended by a reference to local customs. The statement that in the case of palings the nails are driven *from home* is,—unfortunately for the student,—the reverse of the fact.

In the remarks on the computation of land-areas by mechanical aids, it should have been stated that all such expedients are wrong in principle, for they apply a comparatively fixed wood or metal scale to a plan which, from variations in temperature, from mounting, and other causes, is liable to change. The only safe course is to compute such areas by the aid of the scale on the plan itself.

The author evidently understands his subject, but is not always happy in his descriptions. Can any one, who does not already know the principle and application of the vernier make anything out of this? "The vernier is a scale whose length is equal to a certain number of parts of that to be subdivided, and depends on the degree of minuteness which the subdivision of the graduation of the limb is to be carried. However this may be, it is divided into parts, which in number are one more or less than those of the limb taken for the length of the vernier."

Nevertheless, the book contains much valuable advice and instruction on the most delightful and health-giving of all professional pursuits, and only requires a little further care in the revision of the text to make it a useful and trustworthy guide to the student.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

14,374, Chimney Tops. E. C. Theedam.

The cowl or top which is the subject of this patent is made with a partition in the centre carried down within a few inches of a D-shaped check fixed in the interior of the cowl and dividing it. Any over-blow is therefore divided by the check, and the wind passes out through two openings on the underside of the cowl. These side openings are protected by an inside sloping covering, sloping upwards, and on the outside by eaves all round the sides of the cowl or opening.

1,380, Hinges, &c. J. J. Mazelet.

This invention relates principally to the sections of iron used for hinges or iron fittings of windows and glazed doors. By combining one or more of these sections, Z, U, or T shaped strengthening pieces are formed, and it is claimed that the iron which is generally like U in cross section can be used in a variety of ways for hinges, mouldings, sash-bars, and such-like purposes.

2,427, Door Locks and Latches. W. Sanderson.

The object of this invention is to fix or secure the door-knob to a plain spindle by means of a wedge-shaped device acting in combination with a screw collar. The wedges are made in pairs, and are so fixed that when the collar of the door knob is screwed up, they close on the spindle, holding it securely.

2,551, Portable Dust-bin. A Roberts.

The chief novelty in this bin is the peculiar fixing of the handle and cover which, by an arrangement springs or weights returns to a closed position automatically as soon as the bin is emptied. Thus the bin can be emptied and closed without the necessity of using both hands.

11,460, Window Frames. J. Robson.

The object of this invention is to effect an economy in cost, and to dispense with linings, pockets, and sash-weights. The pulleys over which sash-lines or chains pass are fixed in the top of the window-frame, and the ends are attached to each sash respectively, one balancing the other. If much difference in weight, or for additional security, a grip is affixed, by which the window-sash is kept open in any convenient position.

13,278, Composition or Artificial Marble. C. Straub.

According to this invention, glue, water, oil, and muriatic acid are mixed, and at proper intervals, while heated, plaster of Paris is stirred into the mass. By this means artificial marble is made which is durable, and capable of a high polish.

15,212, Improvements in Water-closets. D. Grove.

In order to allow of thorough and regular cleansing, the closet, according to this patent, is made as a bracket closet, the flooring beneath the bowl and seat is kept perfectly free, and all the parts are readily accessible. The handle is placed away from the seat, so that the seat may be lifted, and the basin flushed.

NEW APPLICATIONS FOR PATENTS.

Jan. 14.—584, P. Barrett, Counter-balancing Sliding Sashes or Windows.—589, J. Murphy, Fireproof Construction.—609, Brodie and Prior, Fire-grates.

Jan. 15.—642, F. Hadlow, Artificial Stone or Cement.—643. J. Cropper, Window Sashes and Frames.—678, Jones and Brand, Paving Blocks from Scoria or Slag.—679, J. Corsan, Ornamentation of Wood.—684, Benekendorff and Yungst, Roofing Tiles.—698, O. Elphick, Water-waste Preventers.

Jan. 17.—743, E. Dive, Ventilating.

Jan. 18.—777, N. Leroy, Portable Wooden Houses.—781, H. McDonnell and Others, Ornamental Coverings for Walls, Ceilings, &c.—788, A Boult, Water-closets.—797, Hussey and Clark, Roofing and other Tiles and Slates.

Jan. 19.—841, G. Harcourt, Door Check.—850, R. Kenny, Earthenware Drain-pipes, &c.

Jan. 20.—887, J. Jones. Ventilating Buildings, &c.—909, J. Jeffreys, Introducing Fresh Air to Buildings, styled an "Air Washer."

PROVISIONAL SPECIFICATIONS ACCEPTED.

15,092, W. Bagshawe, the Application of Tubes or Pipes to the Construction of Roofs.—15,473, J. Winkler, Moulding Building Blocks.—15,552, H. Lowden, Roofing Tiles, &c.—16,429, F. Hayward, Varnish.—16,472, W. Scharrath, Level.—16,489, H. Johnson, Water-wheel Air Propeller for Ventilating.—16,730, A. Dawson, Door Locks.—10,682, P. Everitt, Water-closets, Lavatories, &c.—12,588, W. Day, Chimney Pot and Ventilator.—15,570, W. White, Flushing Cisterns.—15,620, S. Timings, Closing Springs for Doors and Gates.—15,965, C. Dobbs, Moulded Slag Paving Blocks.—16,612, C. Harris, Chandeliers, Gaseliers, and Gas Brackets.—16,708, M. Syer, Syphon Cisterns for Flushing Closets, &c.—17,125, Paxton & Turnbull, Kitchen Ranges.—43, W. Martin, Domestic Firegrates.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to Opposition for Two Months.

2,286, A. Schanschieff, Locks and Latches.—3,420, G. Jarvis, Basic Bricks.—3,452, J. & F. Loughran, Window Sashes and Frames.—3,712, Sutherland & McIntosh, Bakers' Ovens.—3,948, Ahrbecker & Grew, Water Meters.—4,580, J. Parker, Dry Earth and Ash Closets.—8,713, M. Blanchard, Ornamental Tiles, &c.—9,444, T. Taylor, Door Knobs, &c.—1,691, T. Helliwell, Zinc or other Metal Roofing.—2,302, B. Phillipson, Water-closets and Pipes, and Connexions for Same.—2,671, Swindell & Clifford, Chimney and Ventilating Caps.—3,569, J. Dyson, Wall Bonds or Bricks for preventing Damp Walls.—6,426, W. Parry, Construction of Floors, Roofs, Arches, &c.—11,511, Nicol & Hercus, Kitchen Ranges.

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

JANUARY 17.

By Best & Fry.

Holloway—28, Campbell-road, 79 years, ground-rent 5*l*.	£150
40, Rupert-stoeet, 79 years, ground-rent 5*l*.	155

JANUARY 18.

By G. Stockings.

Kensington — 111, Earls Court-road, 84 years, ground-rent 15*l*.	2,000

By R. Boyce.

Hoxton—27 to 33 and 49 to 59 odd, Gifford-street, 12 years, ground-rent 50*l*.	900
3 to 8 and 12 to 17, Tyssen-street, 14 years, ground-rent 33*l*.	1,050
45 and 47, Gifford-street, 14 years, ground-rent 6*l*.	310
Holloway — 101, Tabley-road, 79 years, ground-rent 7*l*.	360
Hoxton — 90 and 92, St. John's-road, 37 years, ground-rent 9*l*.	700

By H. Rutley.

Camden Town—75, Arlington-road, 50 years, ground-rent 7*l*.	600
Kilburn — 91, Pembroke-road, 75 years, ground-rent 8*l*. 10s.	180
Tottenham Court-road—1 and 3, Grafton-street, 22 years, ground-rent 18*l*. 8s.	1,930
7, Grafton-street, and 110, Huntley-street, 22 years, ground-rent 16*l*.	1,350
102 to 110 even, Huntley-street, 22 years, ground-rent 42*l*.	3,185
11 and 12, University-street, 21 years, ground-rent 15*l*.	1,210

JANUARY 19.

By Farebrother, Ellis, Clark, & Co.

Mincing-lane, E.C.—Ground-rent of 140*l*. reversion in 74 years	3,820
Putney Hill—1, Cambalt-road, 94 years, ground-rent 25*l*.	1,700
Acton, High-street—"Lichfield House" freehold	1,785
A plot of freehold land	1,140

JANUARY 20.

By J. Hibbard.

Clerkenwell—6, Great Bath-street, freehold	1,430

By Blake, Haddock & Co.

New Cross, Surrey—Freehold land, 9a. 1r. 20p.	13,300

JANUARY 21.

By Baker & Son.

Regent's Park—5, Taunton-place, 22 years, ground-rent 7*l*. 4s.	340

A House of Straw.—It is stated that at the forthcoming American Exhibition, which is to be opened on May 2nd at Earls Court, Kensington, will be a house of straw, now being made in Philadelphia. This house is an American suburban villa, "two-and-a-half stories high," and covering a space of 42 ft. by 50 ft. It is built entirely of materials manufactured from straw, foundations, timber, flooring, sheathing, roofing,—everything, in fact, including the chimneys, the material being fireproof as well as waterproof. The inside finish will be in imitation rosewood, mahogany, walnut, maple, ash, ebony, and other fine woods, the straw lumber taking perfectly the surface and colour of any desired wood.

Timber-Drying.—We have already described Mr. Philip Parsons's "Common-sense" Patent Drying-kiln. We hear that Mr. John T. Chappell, the well-known builder and contractor, is erecting at his works, Thames Bank Wharf, Pimlico, two large drying-rooms, each 43 ft. long, on the "Common-sense" system.

The Student's Column.

FIELD WORK AND INSTRUMENTS.—V.

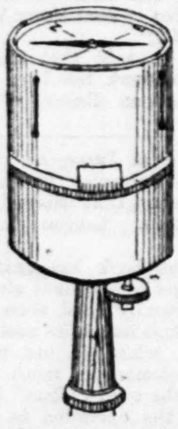
Surveying Instruments.

V.—THE CROSS STAFF.

THE cross staff consists in its simplest form of a rod, having a spike at its lower end for fixing into the ground, and two pairs of sights attached at right angles to one another at its upper end. Sometimes these sights are made with hinged joints to fold down, and at other times two fine grooves are sawn at right angles to one another, through a block of wood, which forms the head of the instrument.

Fig. 1 shows a cross staff head with brass fittings. The rod which connects it to the ground is set up, and fixed plumb over the point at which the right angles are required to be set out. The head consists of an octagonal brass box having slots in four of its sides, two of each being in line with one another through the centre of the instrument, and so cut that a broad opening comes horizontally exactly opposite a small circular opening, the latter serving as an eye-piece. In the centre of each of the broad openings shown below A and above D in fig. 1, are fixed wires or horse-hairs, which are intended to range the eye in adjusting the instrument over the rod upon the main line, and to act as a guide in setting out the cross line. Narrow openings with a small circular hole at top and bottom are provided opposite one another in each of the four remaining sides of the octagon, as shown between A and D in fig. 1. On the top of the cross staff head is shown a compass box, which can be revolved round by the hand, while the lower octagonal portion remains fixed. By means of this compass the magnetic meridian can be obtained with reference to any required direction. This is accomplished by setting the points on the compass box, marked north and south, as near as possible in the direction of the line under observation, and allowing the needle to float freely on its centre; then when the needle is at rest the angle which the magnetic meridian makes with the given line can be read off the graduated ring, which is marked round the edge of the compass box. By means of a small catch or trigger in the side of the box, situated in the rim where the word "compass" is marked in our illustration, the needle can be thrown off its bearing when not in use.

The cross staff is sometimes constructed in a circular form instead of the octagonal shape shown in fig. 1, and may be fitted with a rack and vernier, in addition to the compass box, as shown in the accompanying cut. When this is done, the upper portion is made to revolve upon the centre of the box over a graduated circle fixed upon the circumference of the instrument, so that when great accuracy is not of importance, any angle may be thus set out approximately.



The accuracy of an ordinary cross staff may be tested as shown in figs. 2 and 3, where A, B, C, D, represents an enlarged sectional plan of the instrument shown in fig. 1. Having set up the cross staff vertically over the point E by means of the rod, which is fixed plumb in the ground, the eye is applied to the small opening at A, and ranged by the vertical hair or wire in the broad slot at C, the pole H is fixed at any convenient distance in the direction of the line of sight A C. Then, without moving the cross staff, the eye is applied at the small opening at B, and ranged by the vertical hair or wire in the broad slot at D, the pole F is fixed in the ground in the direction of the line of sight, B D, which should be at right angles to the direction A C. Having done this, we next turn the cross staff round a quarter of a circle, so that when half-reversed, the position indicated by the letters on fig. 2 take the position shown in fig. 3. If when the line of sight A C points towards F, and the line of sight D B points towards H, the poles F and H, as set out in fig. 2, still remain, when viewed in fig. 3 in the lines of sight A C and D B respectively, the instrument is correct. If not, it must be returned to the makers for adjustment.

The cross staff is used for setting off perpendiculars from a base line that are too long to be approximately estimated by the usual tape or offset rod measurements, also for laying-out streets and building lots, and for setting out lines of cross-sections at right angles to a longitudinal direction, preparatory to taking levels. In the latter case the instrument commends itself as being sufficiently simple for a sharp intelligent chainman to be trusted to assist the surveyor in setting out his transverse sections, whereas an optical square or box sextant could only be used for this purpose either by the surveyor himself or a competent assistant.

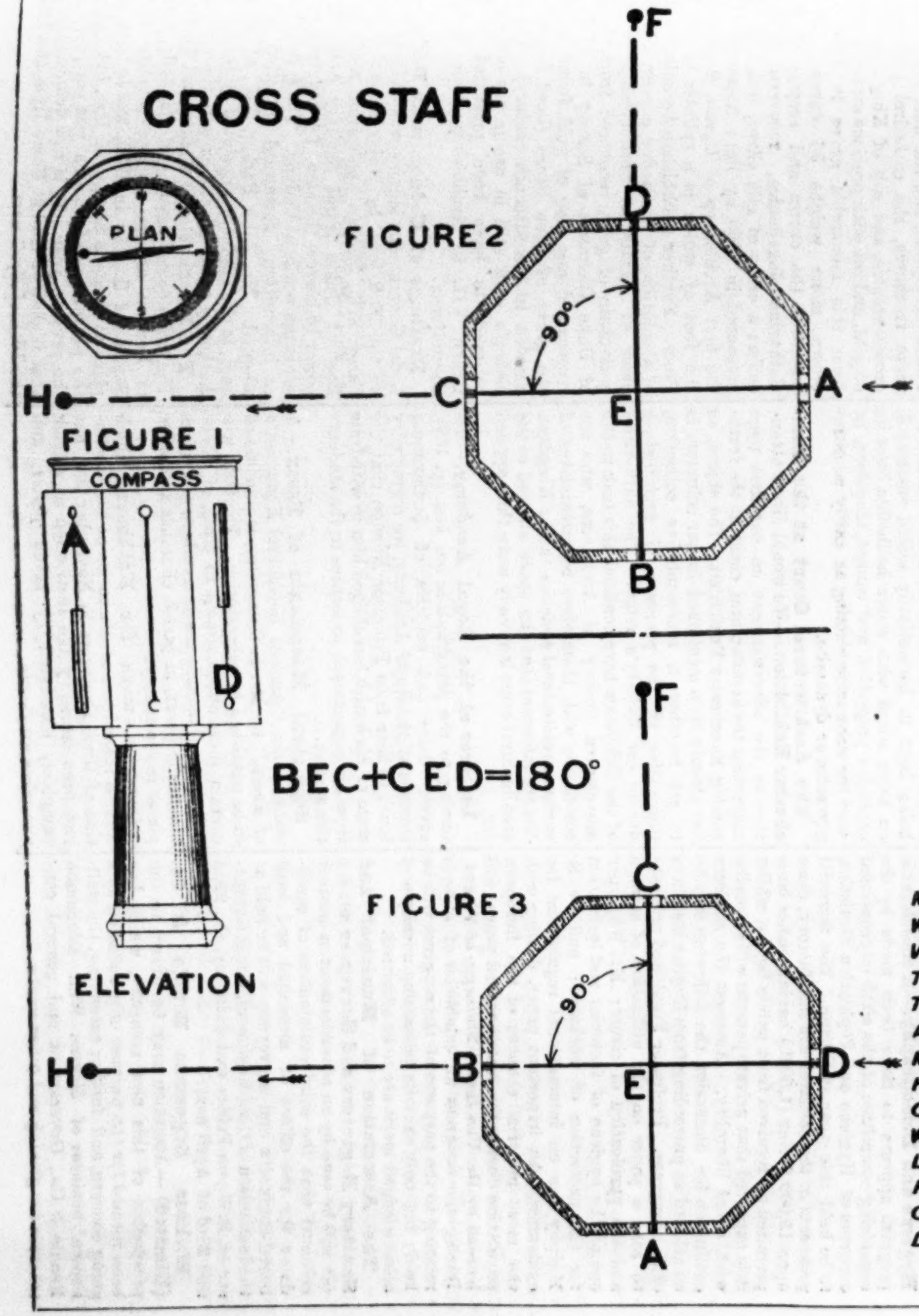
VI.—THE PRISMATIC COMPASS.

The prismatic compass is shown in fig. 4 open ready for use, consisting of a glass-covered box containing a magnetic needle, which turns upon an agate centre. The needle is either attached to a card, as shown, or to a light graduated silver ring, which revolves with it. The ring or card has its outer edge graduated into degrees and half degrees, sometimes subdivided into 20 min. or thirds of a degree. That known as Major Hutchinson's pattern constitutes the Woolwich and Sandhurst instrument, and consists usually of a box about 2¼ in. diameter. When packed in a leather sling case it is very portable, and largely used in military surveying.

A magnifying prism, situated between A and B in fig. 4, is attached to one side of the box, and made to slide up and down in a groove, so as to obtain a proper focus for reading the divisions distinctly upon the circle underneath. Upon the opposite side is attached a vane having a fine thread marked C down its centre. This vane is equal in height to the diameter of the box, and has a hinged joint so as to turn down flat upon the glass, or upon the fixed cover plate over the glass. This cover is indicated in fig. 4 by only a portion of the card being seen. When turned down, this vane lifts the card off its bearing, and the needle ceases to act. When turned up, as shown in fig. 4, the needle is free to turn, and the instrument must be held horizontally so that the card may play freely on its centre, otherwise the results obtained will not be accurate. The sliding framework by which the prism at B can be raised or lowered for arranging the focus, is also connected by a hinged joint so as to fold back, and be easily packed in the case when not in use. In order to show bearings in degrees to the east of north the card is graduated from the south, reading west, as shown in fig. 5. The numbers also are inverted upon the card, so that they may be refracted in an upright position through the prism of glass while viewing the direction required. The vibrations of the compass card when playing freely, can be checked by gently pressing a small spring, not shown in the illustration, but generally placed in the side of the box under the sight vane C, and below the level of the floating card. When the compass is held over a station point or any selected point in a line, and an object is viewed through the hole and slit in the prism at B, the instrument is turned horizontally by the hand until the fine thread in the vane at C bisects the point under observation. When the card is at rest, the number of degrees indicated in the line of sight is read through the prism. If, under certain circumstances, an increased amount of light should be found necessary in order to read the figures correctly, the card can be clamped while at rest, and the instrument tilted up a little above or below the horizontal, until there is sufficient light upon the card to see the divisions distinctly.

Tanagra Terra-Cotta Reproductions.—Messrs. Bellman & Ivey wish us to say that they are not the makers of these, which are made by Mr. R. Lechner, of Vienna, whose sole London agents they are.

CROSS STAFF



BEC+CED=180°

PRISMATIC COMPASS

—HUTCHINSON'S PATTERN—

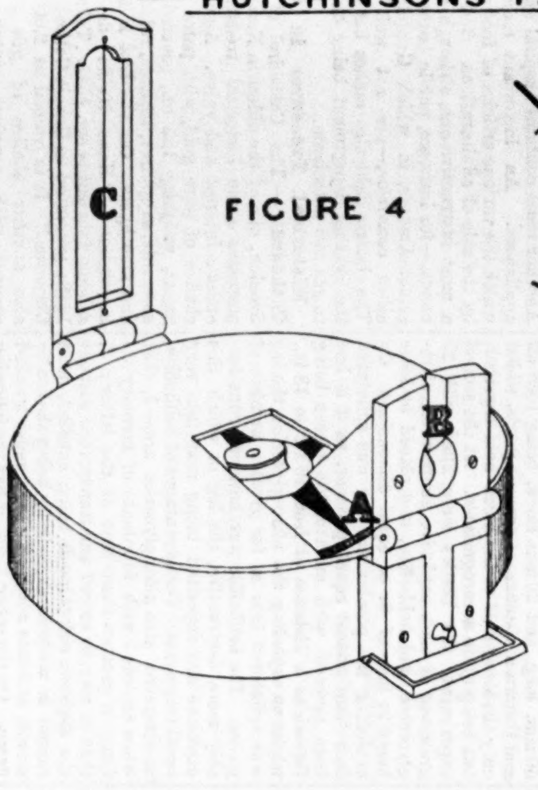
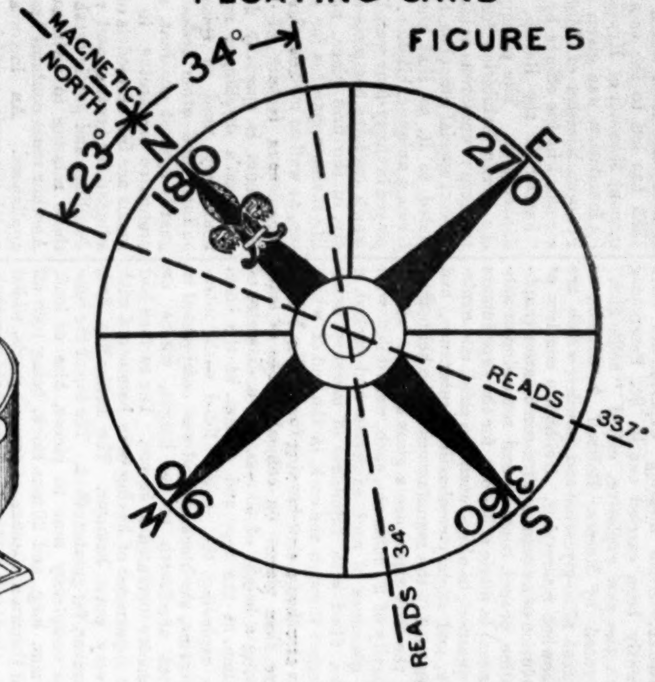


FIGURE 4

PLAN OF FLOATING CARD

FIGURE 5



360° − 337° = 23°

*MAGNETIC MERIDIAN.—THE PRISMATIC COMPASS IS HELD IN THE DIRECTION OF A GIVEN LINE, THE BEARING OF WHICH IS REQUIRED.—THE INSTRUMENT IS THEN TURNED HORIZONTALLY IN THE HAND UNTIL THE VERTICAL SIGHT VANE AT **C**, WHEN VIEWED AT **B**, COMES IN THE DIRECTION OF THE GIVEN LINE. THE FLOATING CARD IS ALLOWED TO SETTLE, AND IS THEN MAINTAINED AT REST BY PRESSING THE SPRING STOP SITUATED BELOW **C**.—THE NUMBER OF DEGREES INDICATED UPON THE CARD AT **A**, IS THEN READ THROUGH THE PRISM OF GLASS AT **B**.—AS SHOWN UPON THE PLAN OF THE FLOATING CARD, THE ZERO OR 360° CORRESPONDS WITH THE SOUTH POLE IN THE MAGNETIC MERIDIAN, 90° IS MARKED ON THE WEST SIDE, 270° ON THE EAST SIDE, AND 180° DENOTES THE NORTH; HENCE IN READING THE CARD AT **A**, THE DIRECTION OF THE MAGNETIC NORTH, WILL LIE TO THE LEFT HAND SIDE OF THE SURVEYOR, WHEN THE ANGLE READ, IS LESS THAN 180°, AND TO THE RIGHT HAND SIDE OF THE SURVEYOR, WHEN THE ANGLE READ, EXCEEDS 180°.—THE EXACT DIRECTION OF THE MAGNETIC MERIDIAN, WILL BE IN A LINE; MAKING AN ANGLE WITH THE GIVEN LINE; AT THE POINT OF VISION, EQUAL TO THE NUMBER OF DEGREES READ UPON THE CARD, WHEN THIS ANGLE IS LESS THAN 180°; BUT IF THIS RESULT EXCEEDS 180°, THE ANGLE OF DEVIATION, AT THE POINT OF VISION IS EQUAL TO THE DIFFERENCE BETWEEN 360° AND THE NUMBER OF DEGREES READ UPON THE CARD.—*

MEETINGS.

Saturday, January 29.

St. Paul's Ecclesiological Society.—Annual Meeting. 2.30 p.m.

Monday, January 31.

Royal Institute of British Architects.—Mr. William Simpon, F.R.G.S., on "Mud Architecture: Notes made in Persia and other Countries." 8 p.m.

Royal Academy of Arts (Lectures in Sculpture).—Mr. A. S. Murray on "Greek Sculptures Expressive of the Emotions: after Pheidias." 8 p.m.

Society of Arts (Cantor Lectures).—Dr. Thudichum on "The Diseases of Plants, with special regard to Agriculture and Forestry." II. 8 p.m.

Tuesday, February 1.

Society of Arts (Applied Art Section). — Opening address on "The Present Condition of Applied Art in England, and the Education of the Art Workman. By Mr. T. Armstrong, Director of the Art Division, Science and Art Department. 8 p.m.

Institute of Builders.—Third Ordinary General Meeting, to Receive Report of Council, &c. 3·30 p.m.

Institution of Civil Engineers.—Discussion on Mr. W. J. Dibdin's and Mr. W. Santo Crimp's papers on "Sewage Sludge and its Disposal." 8 p.m.

Society of Biblical Archæology.—Rev. C. J. Ball on "The Metrical Structure of Zenonth." 8 p.m.

Birmingham Architectural Association.—Discussion, to be opened by Mr. Henman, on "Stonework *v.* Terra-Cotta." 7·30 p.m.

Wednesday, February 2.

Civil and Mechanical Engineers' Society.—Mr. W. Lee Beardmore on "House Drainage." 7 p.m.

Society of Arts. — Dr. Alfred Carpenter on "Sewage Irrigation." 8 p.m.

British Archæological Association. — (1) Mr. W. de Gray Birch, F.S.A., on "The Danes in England and the Rebuilding of London by King Alfred." (2) Mr. J. T. Irvine on "Communion Plate, Peterborough Cathedral." 8 p.m.

Builders' Foremen and Clerks of Works' Institution.—Ordinary Meeting. 8·30 p.m.

Thursday, January 3.

Institution of Mechanical Engineers.—Fortieth Annual General Meeting. 7·30 p.m.

Royal Archæological Institute.—Mr. Albert Hartshorne, F.S.A., on "Blythborough Church." 4 p.m.

Edinburgh Architectural Association. — Mr. John Kinross, on "The Jesuit Churches of Italy." 8 p.m.

Friday, February 4.

Architectural Association. — Discussion on Professor Corfield's lecture on "House Sanitation." 7·30 p.m.

Royal Institution.—Mr. Edwin Freshfield, V.P.S.A., on "Some Unpublished Records of the City of London." 9 p.m.

Institution of Mechanical Engineers.—Fortieth Annual General Meeting (continued). 7·30 p.m.

Institution of Civil Engineers (Students' Meeting).—Mr. John Goodman, on "Recent Researches in Friction." 7·30 p.m.

Saturday, February 5.

Architectural Association.—Visit to a new Church at Wimbledon. 3 p.m. (See advertisement.)

Association of Public Sanitary Inspectors. — Fourth Annual Dinner. 6 p.m.

Miscellanea.

The Sixth International Congress of Hygiene and Demography.—A considerable progress appears to have been made by the organising committee of the sixth international congress of Hygiene and Population Statistics, to be held this year at Vienna. The financial prospects of the congress are satisfactory, close upon 15,000 florins (1,500*l.*) having either been promised or received from public bodies, whilst it is expected that private persons will subscribe with equal liberality. Amongst the subjects coming on for discussion the following may be mentioned as proceeding from English members of the congress. Professor Frankland proposes to read a paper on the utilisation of sewage and the purification of rivers; Mr. Whymper one on the hygiene of factories and legislation for the protection of workmen; and Dr. S. Murphy one on international regulations for epidemics. An important paper, dealing with the most material changes of the European population during the last thousand years, will be read by Dr. Von Inama-Sternegg, of Vienna. During the congress an exhibition of objects relating to the purposes of the congress will be held; but only exhibits possessing novelty and acknowledged merit are to be admitted.

The Association of Municipal and Sanitary Engineers and Surveyors notifies (as will be seen by an advertisement in another column) that the third examination of candidates for the offices of municipal and local board engineers and surveyors will be held at the Institution of Civil Engineers, Great George-street, S.W., on Friday and Saturday, the 22nd and 23rd of April next.

William Edgcumbe Rendle & Co. (Limited).—Attention may be drawn to the prospectus of this new company, which has been formed for the purpose of purchasing as a going concern, and further extending, the well-known business of Messrs. Wm. Edgcumbe Rendle & Co., Government and general contractors for glazing and other works.

Hellhoffite versus Nitro-glycerine and Powder.—Some blasting experiments have recently been carried out in St. Petersburg with the new explosive, called "hellhoffite," invented by Messrs. Hellhoff & Gruson, as against nitro-glycerine and powder, which are somewhat interesting. Hellhoffite consists of a solution of an organic nitro-combination (naphthaline, phenol, benzine, and some similar substances) in nitric acid; but, for the experiments in question, bi-nitro-benzine, a solid, non-explosive, and slightly-combustible substance, had been used in the manufacture of the hellhoffite. At the first experiments glass bottles, with a capacity of 20 cubic cm. each, were filled with 20 grammes of each explosive and corked, a tube, filled with fulminate of mercury, being inserted through the cork, in the end of which was attached a slow-burning fuse. The bottles were then placed on conical blocks of lead, having a height of 60 mm. and a diameter of 35 mm. at the top, and 45 mm. at the base. On exploding the bottle filled with nitro-glycerine, the block of lead was compressed to about one-fourth of its height, whilst its diameter increased to 55 mm. The surface had the appearance of having been hammered with a very worn hammer. The hellhoffite had, however, far greater effect. The top of the cone was completely rent to pieces, bits of lead, 50 mm. long, and 20 mm. thick, being torn off and thrown a distance of several yards, whilst only the lower half of the block held together, but being quite unrecognisable. At the second experiment, the bottles were filled with 25 grammes of each explosive gunpowder, nitro-glycerine, and hellhoffite, and placed in holes bored in logs of fir of equal dimensions. On exploding the powder the log was splintered into four almost equal portions, as if it had been severed with an axe, the pieces being thrown to a distance of from 10 ft. to 18 ft., whilst on exploding the nitro-glycerine the log was splintered into a far greater number of pieces. The hellhoffite was, however, considerably more destructive, the log in which this explosive was deposited being rent into very small fragments. The advantages of hellhoffite, as compared with nitro-glycerine are,—1, that when exploded with fulminate of mercury its force is greater than that of the latter; 2, that it may be stored and transported without the slightest risk through being handled, as it cannot be made to explode by being shaken or struck, and does not ignite even under a naked flame. On the other hand, it has the following disadvantages:—1, it is a fluid; 2, the rapid evaporation of the nitric acid necessitates its being kept in hermetically sealed vessels; 3, on being mixed with water hellhoffite loses its explosive properties, and cannot, therefore, be used for submarine blasting as easily as nitro-glycerine or dynamite.

The Architectural Court at the Manchester Exhibition.—We would direct attention to the advertisement on our first page respecting the architectural court at the forthcoming Manchester Exhibition. The object, as has already been mentioned in our columns, is to get together a representative collection, illustrative of the progress of architecture during her Majesty's reign. The authorities of the Exhibition have confided this task to the Manchester Society of Architects, who are associating with themselves representatives of various architectural societies in the Kingdom. We are informed that the space allotted to the architectural court is already more than applied for.

Lectures at the Royal Academy.—Referring to the paragraph in our last (p. 168), giving dates and subjects of forthcoming lectures at the Royal Academy, we regret very much to hear from Professor Newton that the state of his health has obliged him to withdraw from his engagement to lecture to the students this session.

Sepulchral Monuments of Essex.—A work on the "Ancient Sepulchral Monuments of Essex," by Mr. F. Chancellor, is announced to be published by subscription. The book will contain illustrations, drawn to scale, of about 150 plates of monuments to members of various families in Essex, in parish churches and other places in the county.

Concrete-work for Harbours, which formed the subject of discussion at the Institution of Civil Engineers in November last, has just been issued by the Institution as a thick pamphlet, illustrated by seven plates and numerous wood-cuts.

The Berlin Museum of Hygiene.—The Health Exhibition which was held at Berlin in 1883 has led to the establishment of a permanent Museum of Hygiene. The impulse to its foundation was given by Herr von Gossler, Prussian Minister of Education, who was ably seconded in his efforts by Professor Koch, the "Father of the Bacilli," as Berlin wit has dubbed him. The principal objects shown at the Berlin Exhibition formed the basis of the museum; numerous exhibits, the best of their several special branches, having been gradually added to it, so that the establishment now forms a unique exhibition. The objects are displayed in thirty-four well-lighted rooms, each of which contains complete departments. There are, in the first place, numerous examples of life-saving apparatus for use both on land and sea, as well as models, those objects forming a conspicuous feature of the late Exhibition. One room is specially devoted to models of workmen's dwellings; another to models of machinery used in spinning, weaving, agriculture, and other industries, provided with guards against accident, as well as of other protective apparatus in workshops. Four rooms are full of models of the various systems adopted for heating and ventilating of private dwellings and public establishments, as well as those relating to water-supply and sewerage. Another room contains hospital and ambulance appliances. An important room is that in which the various articles of food are displayed by the side of adulterations. The Exhibition is a most instructive one, although some departments,—for instance, public baths and washing establishments, in which Germany is behind other countries,—are not well represented. The electric light also makes but a poor show, the lighting department being chiefly confined to gas and petroleum.

Historical Treasures in the Upsala Cathedral. — The Cathedral of Upsala, in Sweden, one of the oldest in Northern Europe, possesses some historical treasures of great artistic interest and value. Among them is a chalice of pure gold, with paten of the same metal, weighing 125 oz., covered with pearls, emeralds, sapphires, topazes, rubies, turquoises, and amethysts. On the foot is the following inscription:—"Haus Hvifft de Hallis hunc calicem fabricatus est, 1541. Taken at Prague, 1648; presented to Upsala Cathedral by Queen Christina." It is valued at 2,000*l.* There is also another chalice of gilt silver, richly covered with precious stones, brought by Charles XII. from Poland. On the foot is a Polish inscription, and the date 1655. Besides these treasures, the cathedral possesses the crown, sceptre, and orb of King John III., all of gold, and set with precious stones, recovered from this monarch's grave in 1833. The crown alone weighs 36 ounces. It also possesses the crown and sceptre of Queen Catharina Jagellonica, recovered from her coffin; a cross of gilt silver, weighing 17 lb., presented in 1160 by Pope Alexander III., to the first Archbishop of Upsala, Stephanus, in the foot of which is a splinter of the Holy Cross. Further Archbishop Arcimbald's shrine of absolution, of enamelled copper, a beautiful piece of Byzantine workmanship; a heavy neck-chain of gold, recovered from the grave of Duke Gustavus of Saxony in 1767; two crosses and one ring of gold, found in 1815 in the grave of Sten Sture (Lord Protector of Sweden in the fifteenth century). The archbishop's staff still in use in the cathedral is believed to have been presented by Pope Urban VII. to Archbishop Jöris Bengtson Oxenotjerna.

Drainage of Codnor, near Derby. — A Local Government inquiry was held at Codnor on the 20th inst. by Major-General C. Phipps Carey, R.E., into an application made by the Basford Union Rural Sanitary Authority for power to borrow the sum of 4,000*l.* for proposed sewerage works at Codnor. The system known as intermittent downward filtration will be adopted. Mr. John Parker, C.E., of Nottingham, is the engineer appointed by the Sanitary Authority to design and execute the works.

The International Statistical Institute. The first general meeting of this body, founded in London at the Jubilee-meeting of the Statistical Society in 1885, was to have taken place at Rome in September last, but owing to the prevalence of cholera was postponed until the present year. It is now definitely decided that it shall be held at Rome from the 12th to the 16th of April next.

The Surveyors' and Auctioneers' Clerks' Provident Association.—The annual report and balance-sheet of this Association, which has its registered office at the Auction Mart, Tokenhouse-yard, E.C., and of which Mr. Daniel Watney is the President, has been issued. The financial statement shows that the Association is in a sound financial position; the capital amount standing to the credit of each object being, in every case, larger than in the previous year. Five members have joined during the year, and none have become disqualified. Only one member has made a claim on the Sick Fund during the past year. The distribution of the members is as follows:—sick fund, 25; life assurance fund, 23 (including one member's wife); superannuation fund, 9; benevolent fund, 7. The committee have had several applications for grants from the benevolent fund from members of the profession not being members of the Association; but on investigation it did not appear that the circumstances of the applicants were such as came under the regulations framed by the committee, and no grants have been made. The annual meeting will be held at the Auction Mart, on Saturday, February 12th, at 3 p.m.

Liverpool Engineering Society. — The usual fortnightly meeting of this society was held at the Royal Institution, Colquitt-street, Liverpool, on Wednesday evening last, Mr. John J. Webster, M.Inst. C.E., President, in the chair. A paper was read by Mr. Charles H. Darbishire, M.Inst. C.E., on "The Ventilation of Sewers." After calling attention to the great disregard that had been generally paid to sanitary matters until recent years, the drainage system of the Houses of Parliament was referred to as an example of the awful state of affairs that could be devised and allowed to remain under the very chambers wherein were enacted the various Public Health Acts and other sanitary laws. The various gases which were usually found in sewer air were then detailed, and a careful description of Doulton's automatic flushing arrangement was given, illustrated by a working model. The systems of ventilation in vogue in various towns were compared, the conclusion arrived at being that the only safe, reliable, and universal system of ventilation was the simple one of as many openings as possible to the sewer. When, owing to faultiness of construction, or to improper matter being allowed to enter, any particular section of the sewer emitted foul gas and effluvium, if the sewer could not be rectified, or the improper matter excluded, special means, depending upon the circumstances of the case and the situation must be adopted to draw off the excess gas to where it could escape without injury to the public health or offence to the senses.

St. Paul's Ecclesiological Society. — In the eighth annual report of this Society, to be presented at the meeting this Saturday, the 29th inst., the Council congratulate the members upon the proceedings of the past year, and say that the general interest manifested, and the very large attendances at the out-door meetings, testify to the continued usefulness and popularity of the Society. During the year, nine meetings have been held at the Chapter House, and papers have been read by Mr. J. T. Micklethwaite, Mr. J. P. Seddon, Mr. Charles Browne, Mr. G. H. Birch, Mr. Hugh Stannus, Mr. Joseph Grimshire, Mr. Somers Clarke, and Mr. Veargitt W. Maughan. Afternoon visits were made to St. Paul's Cathedral, the Charterhouse, the Church of St. Bartholomew the Great, to West Ham, to Hatfield, to Ongar, to Greensted, to St. Mary Cray, and to St. Paul's Cray. A day was spent in Ely. Part I. of the second volume of the Transactions has been issued during the year, and Part II. is in preparation. The balance-sheet shows that the finances of the Society are in a satisfactory condition. There are now 331 members on the register. Seventeen members have been elected during the year, and fifteen have resigned.

Exeter Cathedral.—A local paper says that the Dean and Chapter have decided to commence the erection of the cloister and library on the south side of the nave of the cathedral at once. The architect for the work is Mr. J. L. Pearson, R.A., of London, and the execution of the work is entrusted to Messrs. Luscombe & Son, of Exeter, who executed the work of restoration of the cathedral. The demolition of the old verger's house to make way for the first section of the cloister and library has commenced.

PRICES CURRENT OF MATERIALS.

TIMBER.

TIMBER.	£.	s.	d.	£.	s.	d.
Greenheart, B.G. ton	6	10	0	7	0	0
Teak, E.I. load	9	0	0	14	0	0
Sequoia, U.S. foot cube	0	2	4	0	2	7
Ash, Canada load	3	0	0	4	10	0
Birch ,,	2	5	0	3	10	0
Elm ,,	3	10	0	4	10	0
Fir, Dantsic, &c.	1	10	0	4	0	0
Oak ,,	2	10	0	4	10	0
Canada	3	0	0	6	0	0
Pine, Canada red	2	0	0	3	10	0
,, yellow	2	5	0	4	0	0
Lath, Dantsic fathom	3	0	0	5	0	0
St. Petersburg	4	0	0	5	10	0
Wainscot, Riga log	2	15	0	4	0	0
,, Odessa, crown	3	5	0	3	7	6
Deals, Finland, 2nd and 1st...std. 100	7	0	0	8	0	0
,, 4th and 3rd	6	0	0	6	10	0
Riga	5	10	0	7	0	0
St. Petersburg, 1st yellow	8	10	0	14	0	0
,, 2nd ,,	7	0	0	8	0	0
,, white	7	0	0	10	0	0
Swedish	6	0	0	15	0	0
White Sea	7	0	0	17	10	0
Canada, Pine, 1st	17	0	0	29	0	0
,, ,, 2nd	11	0	0	17	0	0
,, ,, 3rd, &c.	6	0	0	8	0	0
,, Spruce, 1st	8	0	0	11	0	0
,, ,, 3rd and 2nd	5	0	0	7	10	0
New Brunswick, &c.	5	0	0	7	0	0
Battens, all kinds	4	0	0	12	0	0
Flooring Boards, sq. 1 in., Prepared, first	0	9	0	0	13	0
Second	0	7	6	0	8	6
Other qualities	0	5	0	0	7	0
Cedar, Cuba foot	0	0	3	0	0	3½
Honduras, &c.	0	0	2½	0	0	3½
Australian	0	0	2	0	0	3
Mahogany, Cuba	0	0	4	0	0	7
St. Domingo, cargo average	0	0	4	0	0	7
Mexican ,,	0	0	3½	0	0	4½
Tobasco ,,	0	0	4	0	0	6
Honduras ,,	0	0	4	0	0	6
Maple, Bird's-eye	0	0	6	0	0	8
Rose, Rio ton	7	0	0	10	0	0
Bahia	6	0	0	10	0	0

TIMBER (*continued*).	£.	s.	d.	£.	s.	d.
Box, Turkey ton	5	0	0	17	0	0
Satin, St. Domingo foot	0	0	6	0	0	10
Porto Rico	0	0	7	0	1	0
Walnut, Italian	0	0	4	0	0	5

METALS.

	£.	s.	d.	£.	s.	d.
IRON—Bar, Welsh, in London...ton	4	7	6	4	15	0
,, ,, in Wales	4	2	6	4	7	6
,, Staffordshire, London	5	10	0	6	0	0
Sheets, single, in London	6	15	0	8	10	0
Hoops ,,	6	0	0	7	0	0
Nail-rods ,,	5	15	0	6	10	0
COPPER—						
British, cake and ingot ton	42	10	0	43	0	0
Best selected	43	0	0	44	0	0
Sheets, strong	50	0	0	51	0	0
Chili, bars	38	10	0	39	2	6
YELLOW METAL lb.	0	0	4	0	0	4½
LEAD—						
Pig, Spanish ton	12	16	3	12	17	6
English, common brands	13	0	0	0	0	0
Sheet, English	13	18	9	14	2	6
SPELTER—						
Silesian, special ton	14	12	6	14	15	0
Ordinary brands	14	10	0	14	12	6
TIN—						
Straits ton	101	15	0	102	5	0
Australian	102	2	6	102	15	0
English ingots	105	0	0	106	0	0

OILS.

	£.	s.	d.	£.	s.	d.
Linseed ton	20	5	0	20	7	6
Cocoanut, Cochin	37	0	0	0	0	0
Ceylon	26	5	0	26	10	0
Palm, Lagos	23	10	0	24	0	0
Rapeseed, English pale	22	15	0	23	0	0
,, brown	21	10	0	0	0	0
Cottonseed, refined	18	0	0	20	0	0
Tallow and Oleine	25	0	0	45	0	0
Lubricating, U.S.	5	0	0	7	0	0
,, refined	5	0	0	12	0	0
TURPENTINE—						
American, in casks cwt.	1	8	0	0	0	0
TAR—						
Stockholm barrel	0	15	0	0	15	6
Archangel	0	11	6	0	12	0

COMPETITIONS, CONTRACTS, & PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

COMPETITIONS.

Nature of Work.	By whom required.	Premium.	Designs to be delivered.	Page.
Re-Seating Chapel and New Schools	Wesley and Centenary Chapels' Trustees...	15*l*. 15s. and 10*l*. 10s....	March 1st	ii.

CONTRACTS.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Making-up and Paving Roads	Wandsworth Bd. of Wks	*Official*	Feb. 1st	xiii.
Town-Hall and Offices	Fulham Vestry	G. Edwards	Feb. 2nd	xiii.
Hall for Working Men's Club		*Official*	do.	xiii.
Works and Materials	Chelsea Vestry	G. R. Strachan	Feb. 3rd	ii.
Works and Materials	St. Mary, Newington ...	*Official*	Feb. 7th	ii.
Granite Curb	East Ham Local Brd.	W. H. Savage	Feb. 8th	ii.
Timber	Great Western Ry. Co.	*Official*	do.	ii.
Lamp Columns	Willesden Local Board	O. Claude Robson	do.	ii.
Works and Materials	do.	do.	do.	ii.
Erection of Shaft	Edmonton Union	T. E. Knightley	do.	ii.
Repairing Footpaths	Met. Board of Works...	*Official*	do.	ii.
Miscellaneous Repairs, &c.	Tottenham Local Board	— De Pape	do.	ii.
Sewerage Works and Carbolic Disinfectants...	Westminstr Bd. of Wks	G. R. W. Wheeler	Feb. 8 & 16	ii.
Watering and Cleansing Roads	Crown Est. Paving Com.	*Official*	Feb. 9th	ii.
Hospital for Infectious Diseases	Sunderland Cor.	do.	Feb. 10th	xiii.
Brick and Pipe Sewers, &c.	Belfast Corporation ...	do.	Feb. 15th	xiii.
Construction of Sewer	Dartford Local Board...	R. B. Stephens	do	xiii.
Steel Dock Gates and Caisson	Barry Dock, &c., Co. ...	Barry & Brunel	Feb. 18th	ii.
School Desks	Schl. Board for London	*Official*	Not stated...	ii.
New School, Smethwick	Harborne School Brd.	G. H. Cox	do.	ii.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page.
Clerk of Works	Barnet Valley Lcl. Bd.	2*l*. 2s. per week	Feb. 5th	xvii.

TENDERS.

COSHAM (near Portsmouth).—For rebuilding the George and Dragon Inn, for Mr. G. H. Dean. Mr. James W. Stroud, architect, Portsea. Quantities supplied by Mr. C. W. Bevis, Southsea:—

	£	s.	d.
J. Biden	£1,225	0	0
H. Jones	1,225	0	0
J. Crockerell	1,200	0	0
Burbidge	1,153	0	0
Leaver, Cosham	1,144	0	0
D. W. Lewis	1,133	3	3
W. R. & C. Light	1,070	0	0
J. Croad	1,047	0	0
T. Quick	1,030	0	0
J. Collings	962	10	0
W. Learmouth	962	0	0
J. H. Corke	950	0	0
T. P. Hall	940	0	0
C. Dye* (accepted)	907	0	0

* London-road, Kingston, Portsmouth. The others of Portsmouth.

DEPTFORD.—For repairs to twenty-one dwelling-houses in Benmore-street, Dugald-street, and Knott-street, Deptford, for Messrs. Green & Son. Mr. Arthur W. Saville, architect, Strand:—

	£	s.	d.
J. Heath	£630	0	0

COLCHESTER.—For the erection of stables for Messrs. Goby & Sons, Bull-road. Mr. J. W. Start, architect, Colchester:—

	£	s.	d.
Diss	£190	0	0
Eade	184	0	0
Dupont	157	0	0
Cook	149	0	0
Shepherd	144	18	0
Chambers	144	10	0
Ambrose	137	0	0
Shed	137	0	0

LONDON.—For the laying-down of new granite carriage-ways and York-stone footways, the construction of a pipe sewer, and the execution of other works for the purposes of the Tower-hill and Postern-row Improvement, for the Metropolitan Board of Works. Sir J. W. Bazalgette, engineer:—

	£	s.	d.
T. Elkington	£11,180	0	0
Thos. Adams	9,800	0	0
E. & H. Beevers	9,600	0	0
Richard Mayo	9,550	0	0
J. Mowlem & Co.	9,495	0	0
B. Cooke & Co.	9,443	0	0
J. J. Griffiths	9,283	0	0
J. Biggs	9,200	0	0
H. R. Treherne & Co.	9,169	0	0
Martin Wells & Co. (accepted)	8,383	0	0

LONDON.—For re-building printing office for Mr. George Stevens, 87, Commercial-road, E. Mr. Joseph Harris, architect, Bow:—

	£	s.	d.
Hearle	£1,193	0	0
Croft	1,068	0	0
Calman	1,043	0	0
Russell (accepted)	1,027	0	0

LONDON.—For alterations to the Queen's Head Public House, Piccadilly, for Mr. Stewart. Mr. H. I. Newton, architect, Queen Anne's Gate, Westminster:—

	£	s.	d.
Dixon & Jones	£385	0	0
Burman & Sons	359	0	0
Jackson & Todd	239	0	0
John Anley (accepted)	237	0	0

Pewterers' Work.

	£	s.	d.
Davidson	£55	10	0
Helling	50	0	0
Heath	47	0	0
Sanders & Sons (accepted)	46	10	0

LONDON.—For alterations and additions to premises in Whitfield-place, W., for the Borough of Marylebone Radical Club. Mr. Arthur W. Saville, architect, Strand. Quantities supplied:—

	£	s.	d.
W. Downs	£684	0	0
J. Heath	659	0	0
J. Adams	649	0	0
J. Anley	638	0	0
Ward & Lamble	637	0	0
W. Royal	623	0	0
Spencer & Co.	600	0	0
Treweeke	565	0	0*

* As amended. £480 previously tendered in error.

LONDON.—For shop fittings at 133, Tottenham-court-road, for Messrs. J. H. Deakin & Co. Mr. Arthur W. Saville, architect, Strand:—

	£	s.	d.
W. Royal	£165	0	0

PORTSMOUTH.—For extension of drainage, &c., at the Kingston Cemetery, Portsea, for the Portsea Island Burial Board. Mr. James W. Stroud, surveyor, Portsea. Quantities supplied:—

	General Estimate.			Alternative Estimates. A.			Alternative Estimates. B.		
	£	s.	d.	£	s.	d.	£	s.	d.
Roberts & Crosby	648	19	1	654	17	7	663	16	4
W. Learmouth	495	0	0	484	11	0	556	0	0
H. Farminer	429	0	0	448	0	0	456	0	0
D. W. Lewis	416	15	0	416	8	0	465	6	0
E. Boulton	412	14	0	422	14	0	425	5	0
J. H. Corke	363	0	0	378	0	0	388	0	0
J. Croad	362	0	0	362	0	0	367	0	0
W. Ford	359	17	0	371	12	0	373	0	0
C. Dye	353	4	11	359	3	11	359	3	11
T. W. Quick*†	347	0	0	341	0	0	339	0	0

* Victoria-road, Southsea. The others of Portsmouth and Southsea.

† Accepted for estimate A.

RAMSGATE.—For the erection of two houses at Ramsgate, for Mr. J. B. Hodgson. Mr. Alfred R. Pite, architect, Bloomsbury-square:—

	£	s.	d.
Webb	£769	0	0
Wood	585	0	0
Bowman	583	0	0
Martin	544	0	0
May	516	0	0

SOUTHSEA.—For additions to "Wesley House," Victoria-grove, for Mr. J. W. Gardner. Messrs. James W. and John W. Stroud, architects. Quantities supplied:—

	£	s.	d.
H. Jones	£350	0	0
W. Wood	331	4	8
T. P. Hall	330	0	0
J. Croad	317	0	0
D. W. Lewis	315	0	0
J. Crockerell	312	0	0
W. & J. Briggs	293	0	0
J. H. Corke	290	0	0
J. Rogers	243	9	9
Learmouth* (accepted)	225	0	0

* Emsworth-road, Kingston, Portsmouth. The others of Portsmouth and Southsea.

SWINDON.—For erecting house and shop in Regent-street, New Swindon, for Mr. J. B. Baker. Mr. William Drew, architect, Swindon:—

	£	s.	d.
Wiltshire, Swindon (accepted)	£370	0	0

SPECIAL NOTICE.—Lists of Tenders frequently reach us too late for insertion. They should be delivered at our office, 46, Catherine-street, W.C., *not later than Four p.m.* on THURSDAYS.

TO CORRESPONDENTS.

Registered Telegraphic Address, "The Builder, London."

S. H. S. (if the words "each casement" are on specification the contractor is bound to put a hopper light in each, and knows that as well as you do. If the words were "each window" there might be ground for difference of opinion, but the fair conclusion would be in your favour even then).—H. E. P.—W. P. (no such question could be fairly answered without an inspection of the work on the spot. We do not undertake to advise on disputes between owners and builders).—"Demon Damp" (the first part of our last answer applies to this also. Opinion cannot be given, to be worth anything, without inspection on the spot).—J. T.—W. C. & Co.—F. M. (not to an unlimited depth, certainly. In a long frost the thickness of ice would go on increasing to some extent, probably only very slightly after the first few days, as after a certain point the ice itself becomes a protection from cold to the water under it, which is also receiving a comparative amount of warmth from the earth.)—A. R. (we will consider your letter with a view to inserting some portion of it next week).—C. P. A. (does not comply with our conditions).—W. T. H. (should have sent amount).—F. W. (see answer to C. P. A.).

All statements of facts, lists of tenders, &c., must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

We cannot undertake to return rejected communications.

Letters or communications (beyond mere news-items) which have been duplicated for other journals, are NOT DESIRED.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; all communications relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

FIRE BRICKS.

E. BOWEN, Fire Brick Manufacturer, STOURBRIDGE.

Manufacturer of Best Stourbridge Fire Bricks, and Cement Fire Clay, Gas Retorts, Muffles, &c. Fire Bricks and Blocks for the Highest Heats, for Iron Blast Furnaces, Forge, Rolling, Puddling, and Steel Furnaces, Pottery, Bottle, and Flint Glass Furnaces, Roasting and Refining Furnaces, Chemical Works, Coke Ovens, &c. Boiler Seating Blocks, Flue Covers, Locomotive Bricks, Tuyeres, Steel Runners, Grate Backs.

Special Sizes and Shapes made to Engineers' Drawings.
Prices quoted to any Port or Railway Station.
London Agents:—
R. CULL & SON, *Palmerston-buildings, E.C.*
Stores:—Railway Arches, Corner of London-street and Brady-street, near Bethnal Green Station.

GLAZED BRICKS.

OATES & GREEN, HALIFAX.

GLAZED BRICKS (White and Coloured), Special Salt Glazed Bricks Sanitary Tubes, Glazed Earthernware Sinks, Cattle, Sheep, and Pig Troughs, Horse Mangers, Patent Automatic Trough Closet, Patent Flush Tank, Channelling for Stables and Yards, Salt Glazed Bricks for Stables, Sewers, &c. Ventilating Bricks, Patent Ventilating Gullies and Traps, Garden Edging, Patent Chimney Pots and Cures for Down Draughts, Patent Drain-Cleaning Rods.

Six Prize Medals. Copies of Testimonials sent if required.
London Agents:—
R. CULL & SON, Palmerston-buildings, E.C.
Stores:—Railway Arches, Corner of London-street and Brady-street, near Bethnal Green Station.

BLUE BRICKS.

THE KETLEY BRICK COMPANY, Manufacturers of Staffordshire Blue Bricks, KINGSWINFORD, near Dudley, Staffordshire.
London Agents:—
R. CULL & SON, Palmerston-buildings, E.C.
Stores:—Railway Arches, Corner of London-street and Brady-street, near Bethnal Green Station.

DRAIN PIPES.

Lime, Cement, Bricks, Slates, Laths, Hair, Sand, Plaster, Stable Paving Bricks, Wall Copings, Channel Bricks, Blue and Red Ridges. Red Plain Tiles and Pan Tiles, Closet Pans and Traps. Drain Pipes, Bends, Junctions, &c. all sizes. Chimney-Pots, Red and White, Fire Bricks, Lumps, Tiles, Fire Clay. PRICES on APPLICATION.
R. CULL & SON'S Stores, Railway Arches, Corner of London-street and Brady-st., near Bethnal Green Station.
Chief Office:—72, Palmerston-buildings, Old Broad-street, E.C.

Best Bath Stone.

CORSHAM DOWN, FARLEIGH DOWN, } SUMMER DRIED.
BOX GROUND. COMBE DOWN.
WESTWOOD GROUND.
RANDELL, SAUNDERS, & CO., LD.,
CORSHAM, WILTS.

Bath Stone.

BEST QUALITY OF ALL KINDS.

PICTOR & SONS,
BOX, WILTS. [ADVT.

Doulting Freestone.

THE CHELYNCH STONE. { The stone from these quarries is known as the "Weather Beds," and is of a very crystalline nature, and undoubtedly one of the most durable stones in England.

THE BRAMBLEDITCH STONE. { Is of the same crystalline nature as the Chelynch Stone, but finer in texture, and more suitable for fine moulded work.

HAM HILL STONE.

Greater facilities have been provided for working these quarries, and the stone can be supplied in large quantities at short notice.

Prices, and every information given, on application to CHARLES TRASK & SONS, Norton-sub-Hamdon, near Ilminster, Somerset.
London Agent — Mr. E. WILLIAMS,
16, Craven-street, Strand, W.C. [ADVT.

Doulting Free Stone
HAM HILL STONE,
BLUE LIAS LIME
(Ground or Lump),
For prices, &c., address S. & J. STAPLE, Quarry Owners, Stone and Lime Merchants, Stoke-under-Ham, Ilminster. [ADVT.

Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 38, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds, and milk-rooms, granaries, tun-rooms, and terraces. [ADVT.

Asphalte.

Seyssel, Patent Metallic Lava, and White Asphaltes.
M. STODART & CO.
Office:
No. 90, Cannon-street, E.C. [ADVT.

Ladders for Sale or Hire.

One 102-round, Two 90-round Ladders and other Lengths.
Apply to JOHN BATCHELAR,
66, Hammersmith-road, West Kensington.
Close to Addison-road Station. [ADVT.

MAP OF LONDON,
SHOWING BOUNDARIES OF SURVEYORS' DISTRICTS.

The four Sheets, into which the Map is divided (issued with the numbers of January 1st, 8th, 15th, and 22nd), if sent to the Office direct, or through any Newsagent, can be *Mounted on the following Terms, viz.:*—

On Cloth (Rollers) and varnished, 3s. 6d. | On Cloth (Strainer) and varnished, 5s. 6d.

N.B—In the case of "Strainers," if packed for rail or carrier, 1s. 3d. extra.

NOTICE.—THE BANNER SANITATION CO. *beg to give Notice that having sold over* 10,000 BANNER'S PATENT VENTILATORS, *also a proportionate number of other Sanitary Appliances, and wishing to keep pace with the times, they have decided to reduce the prices of their goods from 25 per cent. to 40 per cent., thus offering to the public the best appliances at the lowest prices.*

BANNER VENTILATORS.

The Strongest Exhaust Ventilators for all Buildings, Public Halls, Churches, Billiard-Rooms, &c.

HIGHEST PRIZES at all the most Important EXHIBITIONS.

Gold Medal. Health Exhibition, 1884.

For further Particulars and Revised Prices, apply to

BANNER SANITATION COMPANY,

Wessex House, Northumberland Avenue, Charing Cross, London, W.C.